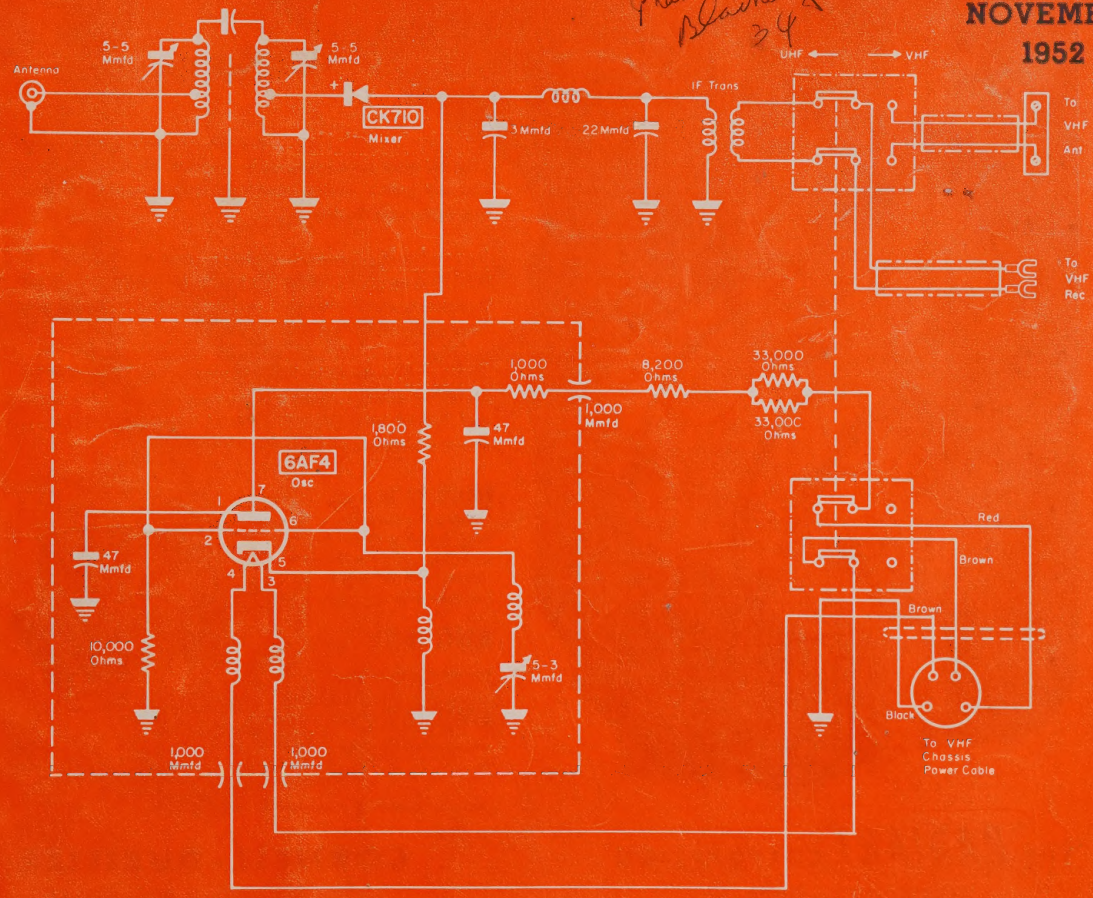
RADIO • TELEVISION • ELECTRONIC

SERVICE

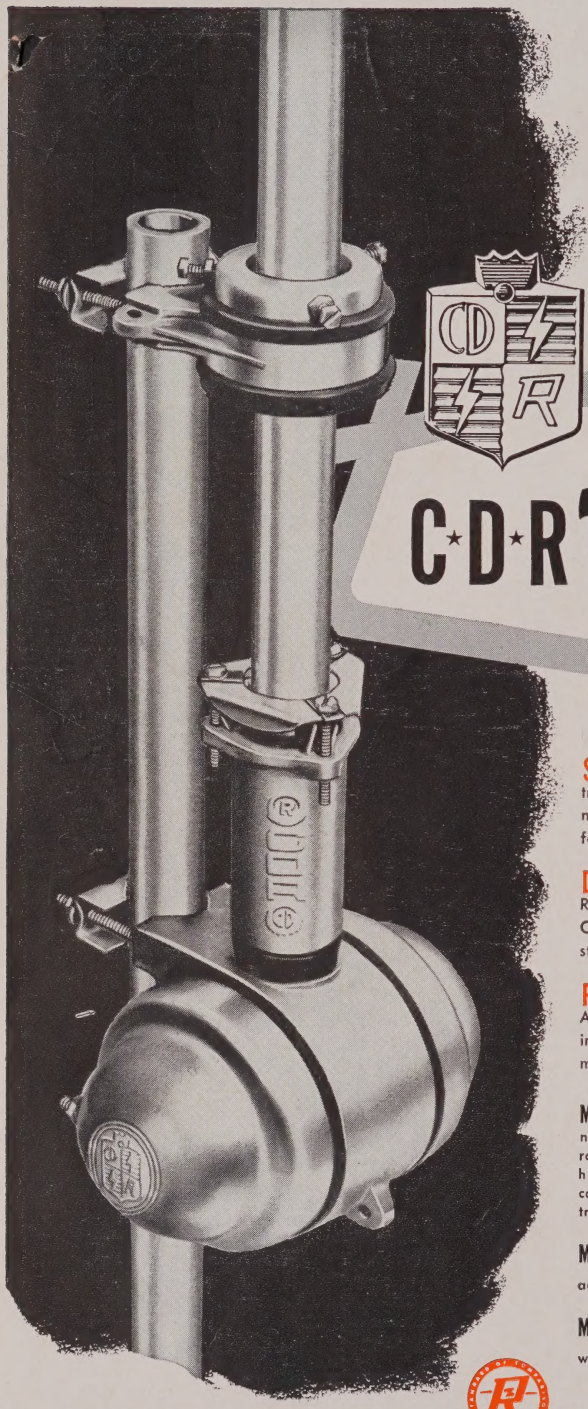
NOVEMBER
1952



UHF selector designed for single-channel tuning.

[see page 3]

THE TECHNICAL JOURNAL OF THE RADIO TRADE



In a Class by Itself

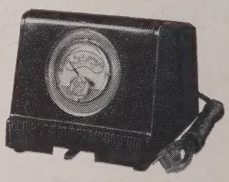
the C·D·R Rotor

Speedy Installation... the servicemen's dream come true! No loose parts to assemble... no kits with loose washers, nuts and bolts... quick mounting antenna mast collet plus four wire cable hookups!

Dependable... experience has proven that once a CDR ROTOR is up... it's THERE TO STAY! No costly call-backs! Completely weather-sealed and streamlined... it's the outstanding value in the field!

Powerful... sturdy in design to support and TURN ANY TV ANTENNA array... never a worry about the CDR rotor working! Locking instantly it will not drift! Instantly reversible... makes a complete revolution in 45 seconds!

MODEL TR-12 A special combination value consisting of complete rotor including thrust bearing... handsome modern design plastic cabinet with meter control dial, only..... $47.95



MODEL TA-6 Thrust bearing accessory, separately.... $4.95

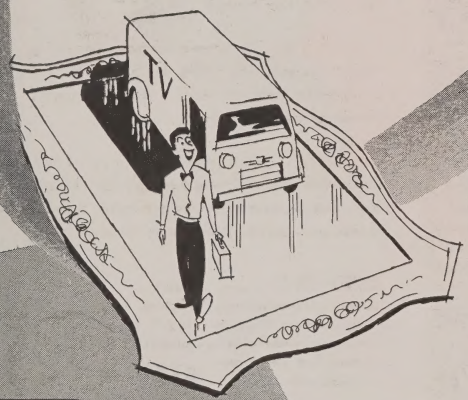
MODEL TR-11 Same as TR-12 without thrust bearing.. $44.95

THE RADIART CORPORATION
CLEVELAND 13, OHIO

SUBSIDIARY OF
CORNELL-DUBILIER ELECTRIC CORP.

CORNELL-DUBILIER
SOUTH PLAINFIELD, NEW JERSEY

ASTRON SERVES UP SATISFACTION



on *Every* Service Call

When you replace with Astron Capacitors you are equaling or bettering original equipment—add to this:

- The service your customer expects
- The exact performance characteristics you demand
- Reduced call-backs everyone demands

And you have a few of the reasons why Astron Capacitors help "serve up satisfaction" to your customers. Alert jobbers are stocking Astron Capacitors—make sure you talk to your supplier today—or write to us for the name of the Astron Distributor nearest you. Send for catalog AC-3.

ASTRON CORPORATION

ASTRON
CORPORATION

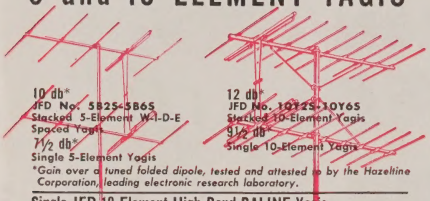
255 Grant Avenue • E. Newark, N.J.

DEPEND ON . . . INSIST ON . . . ***ASTRON***

for the ultimate in sight and sound

Baline**

5 and 10 ELEMENT YAGIS



10 db*
JFD No. 5B2S-5B6S
Stacked 5-Element W-I-D-E Spaced Yagis
7½ db*
Single 5-Element Yagis

12 db*
JFD No. 10Y2S-10Y6S
Stacked 10-Element Yagis
9½ db*
Single 10-Element Yagis

*Gain over a tuned folded dipole, tested and attested to by the Hazeltine Corporation, leading electronic research laboratory.

Single JFD 10-Element High-Band BALINE Yagis

Channels	Models	List Price
7-13	10Y7-10Y13	$13.85

Single JFD 10-Element Low-Band BALINE Yagis

Channels	Models	List Price
2	10Y2	$31.85
3	10Y3	
4	10Y4	$28.45
4 and 5	10Y45	$33.90
5	10Y5	$28.45
6	10Y6	$25.70

Stacked JFD 10-Element BALINE Yagis

Channels	Models	List Price
2	10Y2S	$63.70
3	10Y3S	
4	10Y4S	$56.90
4 and 5	10Y45S	$67.80
5	10Y5S	$56.90
6	10Y6S	$51.40
7-13	10Y7S-10Y13S	$27.70

Include JFD Baline Matching Transformers at No Extra Charge

Single JFD 5-Element High-Band BALINE Yagis

Channels	Models	List Price
7-13	5B7-5B13	$ 7.50
7 and 9	5B79	$10.75

Single JFD 5-Element Low-Band BALINE Yagis

Channels	Models	List Price
2	5B2	$17.60
3	5B3	
4	5B4	$16.65
4 and 5	5B45	$22.05
5	5B5	$16.65
6	5B6	$15.85

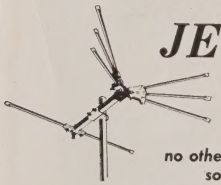
Stacked JFD 5-Element BALINE Yagis

Channels	Models	List Price
2	5B2S	$35.20
3	5B3S	
4	5B4S	$33.30
4 and 5	5B45S	$44.10
5	5B5S	$33.30
6	5B6S	$31.70
7-13	5B7S-5B13S	$15.00
7 and 9	5B79S	$21.50

Include JFD Baline Matching Transformers at No Extra Charge

W-I-D-E-S-P-A-C-E-D

JETENNA**



no other fan conical assembles so fast, performs so well!

Series with 1" seamless aluminum square crossarm and seamless aluminum elements reinforced with heat-treated aluminum dowels.

No. JeT160	Single Bay	Up to 8.8 db*	$12.50 List
No. JeT161	2 Bay	Up to 12.5 db*	$26.40 List
No. JeT164	4 Bay	Up to 15.5 db*	$56.80 List

Series with 1" seamless aluminum square crossarm and butt-seam aluminum elements with heat-treated aluminum dowels.

No. JeT660	Single Bay	Up to 8.8 db*	$ 9.75 List
No. JeT661	2 Bay	Up to 12.5 db*	$20.70 List
No. JeT664	4 Bay	Up to 15.5 db*	$45.40 List

*Performance tested and figures verified by the Hazeltine Corporation, Little Neck, N. Y., World Famous Research Laboratory.

JFD MFG. CO. BROOKLYN 4, N. Y. BENSONHURST 6-9200

World's Largest Manufacturer of TV Antennas and Accessories

** REGISTERED TRADEMARK

JFD Electronics

BALINE AND JETENNA INSPIRED EARRINGS

Vol. 21, No. 11

RADIO · TELEVISION · ELECTRONIC

SERVICE

November, 1952

LEWIS WINNER
Editor

F. WALEN
Assistant Editor

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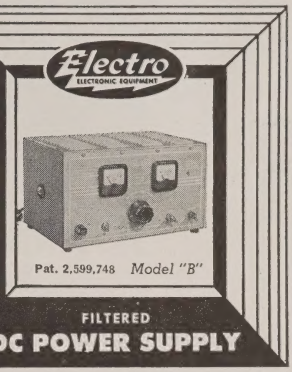
"Services & Tests Auto Radios Best"

SAY RADIO MANUFACTURERS*



Leading Manufacturers Say . . . "It's the only one to withstand continuous high overloads, so we specify the Model "B" for servicing." Exclusive application of selenium rectifiers, aided by conduction cooling, doubles rectifier power rating, dissipates over 3 times the heat with lowest cost per ampere output. 6 volts, up to 20 amperes continuous duty with peak instantaneous rating of 35 amperes. Operates 2 auto radios with push-button solenoids simultaneously. Net $49.80.

Other Uses . . . Operates many low power 2-way mobile radios, phone circuits, relays, instruments, low voltage devices. Battery charging and electroplating.

*Names on request.

Low Cost Model "BJ" POWER SUPPLY
6 Volts DC, 1 to 12.5 Amps. Net $37.50

Model "S"
Converts Battery Radios to All-Electric

Plug into AC outlet. Hum-free reception from any 1½ volt 4-6 tube battery radio. Uses less than ¼ the power of cheapest AC radio. Fits battery space. Guaranteed 3 years.

Many Others Available

FREE BULLETIN
ON BATTERY ELIMINATORS

See Your Distributor or Write to

ELECTRO PRODUCTS LABORATORIES
4501-Sb Ravenswood Avenue
Chicago 40, Illinois
In Canada: Atlas Radio Corp., Ltd., Toronto

Kansas City, Mo. Service, and where to obtain it, is featured in this poster that works fulltime for the serviceman whose name and number show prominently at center. Floodlighting increases the board's usefulness.

Now-for the first time-

FULL-SIZE BILLBOARD ADVERTISING FOR TV-RADIO SERVICEMEN!

Another G-E "first!" Colorful 24-sheet posters spotlight the serviceman's name and phone number —tell owners *who to call* for service!

● Coast to coast, big G-E-tube posters in full colors are answering the query of TV-radio owners: where can I go for reliable, experienced service? Simultaneously, the billboards meet the serviceman's need to tell customers where his shop is located, how to phone him.

G-E-tube posters are a thrifty and productive advertising medium for the serviceman. Hundreds of postings already have been contracted for. They are located where customers-to-be see them, and their large size assures attention. In every case, the serviceman's name, address, and phone number appear in bold type in the center of the poster.

Assisted energetically by G-E tube distributors, G.E. is proud to have pioneered this business-getting aid for servicemen! *Tube Dept., General Electric Co., Schenectady 5, N. Y.*

York, Pa. Beside a busy street, this board is seen, read, and remembered by thousands of TV-radio owners who walk or drive past.

GENERAL ELECTRIC

161-1A6

2 set coupler
Model 477-S*
List $5.45

Mul-Tel

Brach

Brings You The New,

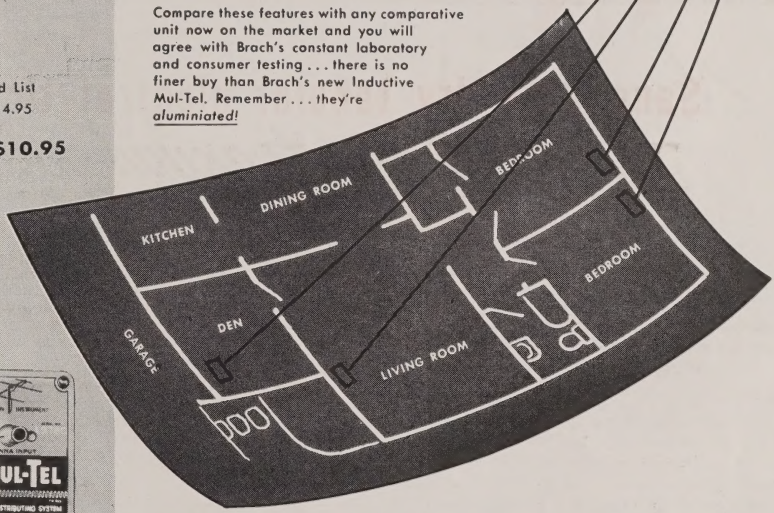
Aluminated, Easy-to-Install Inductive Mul-Tel

4 set coupler
Model 478
List $6.95

Brach Manufacturing Corporation, the founders of the Mul-Tel coupler, proudly present the new advanced-designed Inductive Mul-Tel with the exclusive *aluminated** feature . . .

- ***the only coupler shielded from the inside**
- **internal electrostatic sprayed shield keeps interference away from distribution coils**
- **attractively boxed in shielded plastic housing**
- **complete filter action insured by Brach's factory-adjusted coils**
- **three hundred ohm lead rests on plastic case without danger of shorting effects**

Compare these features with any comparative unit now on the market and you will agree with Brach's constant laboratory and consumer testing . . . there is no finer buy than Brach's new Inductive Mul-Tel. Remember . . . they're *aluminiated!*



2 set coupler Old List
Model 300-300 $14.95

Now $10.95

4 set coupler
Model 72-72
Old List
$19.75

Now $11.95

4 set coupler Old List
Model 300-72 $19.75

Now $11.95

Brach again leads the way with a price reduction—due to increased production on our standard Mul-Tel. These models, long accepted as a criterion throughout the television industry, retain all their original quality features, including:

- **lifetime guarantee**
- **heavy cast-aluminum box**
- **lowest standing-wave ratio components**
- **high-pass filter action**
- **no loading effects between connected television sets**
- **the only 2-set coupler that works for 72 and 300 ohm antenna lines simultaneously**

FREE *Write for booklet "Preparing for UHF Television" by Ira Kamen, noted TV authority.*

Brach

MANUFACTURING CORPORATION

Division of General Bronze Corporation

200 CENTRAL AVENUE, NEWARK 4, NEW JERSEY

Remember: *Brach* leads the way for better reception! Write, wire, or phone your order today.

Sangamo's dry tubular electrolytic capacitor *that fits anywhere*

Type MT and MTD electrolytic capacitors, "Chieftains" of the Sangamo line, are built to provide longer life, greater dependability, and better electrical characteristics in television and other electronic applications. Their small physical size makes them a "natural" for application in tight spots beneath a chassis, and the bare tinned-copper wire leads make them easy to mount.

Sangamo "Chieftains" are contained in hermetically-sealed round aluminum cans and are tightly encased in heavy cardboard sleeves on which polarity is clearly indicated. Double, pure paper spacers assure adequate breakdown characteristics and all sections are tightly held in place within the container. Multiple staking connects the terminal tabs to the electrodes, providing permanent low resistance contact throughout the life of the capacitor. The low voltage units are supplied with etched cathodes to maintain uniform capacity when the capacitor is subjected to heat and high ripple currents.

"Chieftains" are manufactured under controlled conditions of almost surgical cleanliness, utilizing the very finest materials and production procedures available in the industry, for your assurance of quality in every respect.

Your own trial-use will convince you that new standards of dependability and longevity have been built into Sangamo Electrolytics. Order from the new Sangamo Capacitor Catalog No. 800A which is yours for the asking, and without obligation.

Those who know The SANGAMO Tribe PAPER-MICA-SILVER-ELECTROLYTIC CAPACITORS *...choose Sangamo*

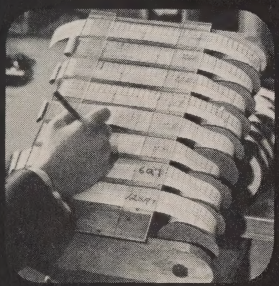
SANGAMO ELECTRIC COMPANY

MARION, ILLINOIS

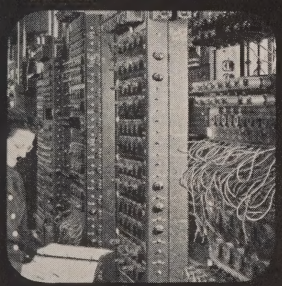
SC52-11

Mica specifications checked to thousandth-inch accuracy.

Completed mounts are inspected for visual defects.

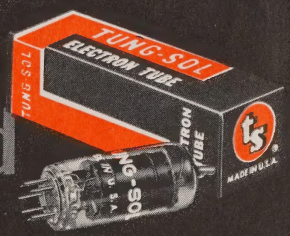


Statistical control assures uniformity of quality and performance.



Life tests prove Tung-Sol Tubes can take it.

Complete control of materials and manufacturing procedures makes Tung-Sol Tubes dependable!



You can build a reputation on Tung-Sol Quality

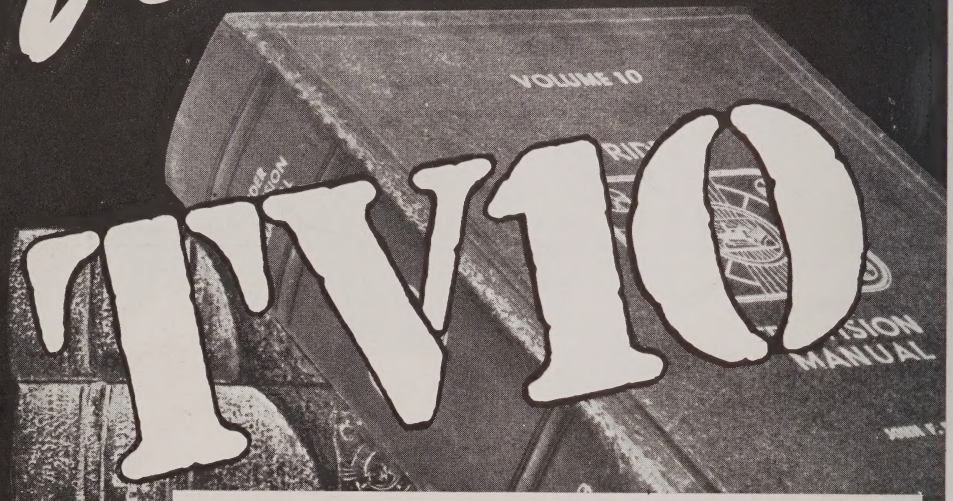
TUNG-SOL ELECTRIC INC., Newark 4, N. J.

Sales Offices: Atlanta, Chicago, Culver City, Dallas, Denver, Detroit, Newark

TUNG-SOL MAKES All-Glass Sealed Beam Lamps, Miniature Lamps, Signal Flashers, Picture Tubes, Radio, TV and Special Purpose Electron Tubes.

It's Here!

TV10



Now — in Rider's latest Television Manual . . . TV 10 . . . you'll find a feature that can't be beat . . . DEPENDABLE REPLACEMENT PARTS LISTINGS! Every replacement part listed meets the physical and electrical performance ratings of the original equipment! And, like everything Rider publishes, TV 10 is *complete* . . . large, easy-to-follow schematics — lots of photos — troubleshooting test patterns — waveforms — enlarged chassis views — circuit changes — different production runs — *everything* you need to do a fast, easy and thorough servicing job! Remember, with a Rider Manual you do the job right the first time . . . because all Rider data is complete, factory-issued, direct from the set manufacturer. You get all the facts — organized and indexed for speed and accuracy. TV 10 contains more than 2,000 (8½ x 11") value-packed pages . . . SEE IT . . . BUY IT . . . AT YOUR JOBBER'S — NOW. $24.

RIDER

JOHN F. RIDER PUBLISHER, INC.
480 Canal St., N. Y. 13, N. Y.
West Coast Office: 4216-20 W. Jefferson Blvd.
Los Angeles, California

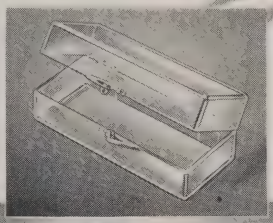
Announcing "Jewel-case" packaging for the

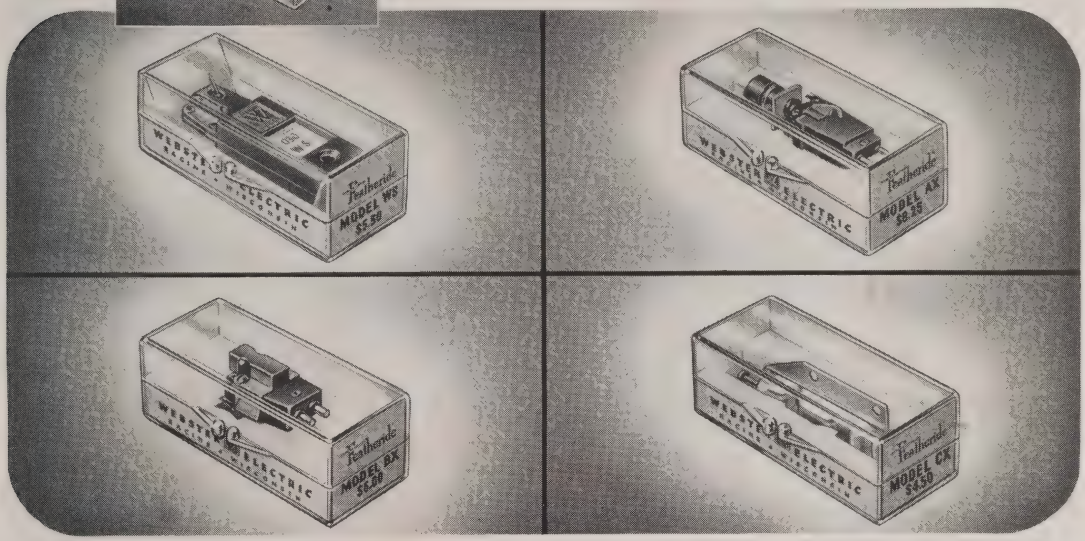
WEBSTER ELECTRIC

Featheride® line of

REPLACEMENT CRYSTAL CARTRIDGES

You and your customers will find countless uses for these beautiful Tenite "Jewel-cases" with hinged covers!





SPECIFICATIONS AND DATA

Model WS—for 78 RPM replacement. Develops 1.5 volts for low output or 4.0 volts for high output. Tracks at ¾ oz.; mounts in any ½ inch mounting.

Model AX—for three-speed, two-needle twist cartridge replacement. Easy to install in any arm with a standard ½ inch mounting. Furnished with removable twist mechanism.

Model BX—for replacement on R.C.A. automatic record changers and Columbia Record Players. Has high fidelity; is compact and light in weight; tracks perfectly at either speed.

Model CX—an exact replacement for Featheride C3, C8, C9 and C9X cartridges. Removable flange and universal mounting bracket permit installation in any arm with ½ inch mounting.

● Effective immediately every Featheride replacement cartridge will be packed for shipment in its own transparent plastic "Jewel-case" box. Each box shows the model number and list price clearly, thus making it even easier for you to stack cartridges in small, easily "get-at-able" space.

These smart new Featheride "Jewel-case" packages contain all fittings necessary for installation, complete data on performance and characteristics, and full installation instructions. . . . Now, more than ever, the Featheride line is your "best bet" for a profitable replacement business. Only a small stock is required to handle practically every replacement job. Mail coupon for new Featheride Bulletin.

Webster Electric Company, Racine, Wisconsin . . . Established 1909

Webster Electric Co., Dept. S-11, Racine, Wis.

Please send me new Bulletin on Featheride Replacement Crystal Cartridges in "Jewel-case" packages.

Name _____ (Please print)

Address _____

City _____ State _____

Jobber ☐ Service Technician ☐ Other ☐

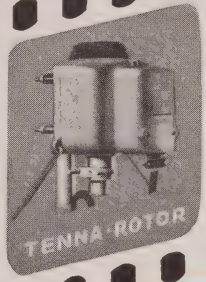
WEBSTER ELECTRIC

RACINE • WISCONSIN

"Where Quality is a Responsibility and Fair Dealing an Obligation"

SOLD THE MOST

(FROM COAST-TO-COAST)



People Buy Most What They See Most!

36 MILLION VIEWERS AROUND 70 TV STATIONS SEE ALLIANCE TV DEMONSTRATIONS!

BECAUSE THEY'RE

SEEN THE MOST!

The Buying Impulse is there—why not *Tap* it?

Alliance TV spots *Convince*, Demonstrate and pre-sell! Newspaper ads fit *each market!* Alliance TV products are sold the most because they're seen the most!

Place your orders *now* for the NEW Alliance Cascamatic Booster with the Famous "*California Circuit!*"

This Fully Automatic, 3-tube TV Booster pre-tuned to all VHF channels mounts instantly on back of set—another companion item to Alliance Tenna-Rotor and Tenna-Scope, the selective, single-control Booster.

ALLIANCE MANUFACTURING COMPANY • ALLIANCE, OHIO

TO SELL MORE MASTS

be a BAKER Dealer

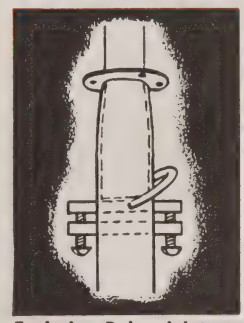
Sales pick up quick when you stock Baker Television Masts—Most in demand by dealers.

Dealers prefer Baker 10′, 20′, and 30′ television masts because they are better engineered and better built for quicker sales, quicker installation and more complete buyer satisfaction.

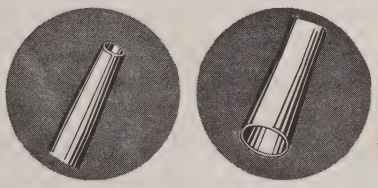
And not only are Baker masts built better, sold quicker and installed faster but they are priced better too.

BAKER 20′ AND 30′ TELESCOPING MASTS

The Baker telescoping masts feature an exclusive patented Baker joint for quicker, easier vertical erection eliminating cumbersome tip-ups. The sections stop and lock automatically in place when fully extended and will not pull completely out. The special snap action safety catch prevents sections from sliding back during erection. Installer has hands free.



Exclusive Baker joint



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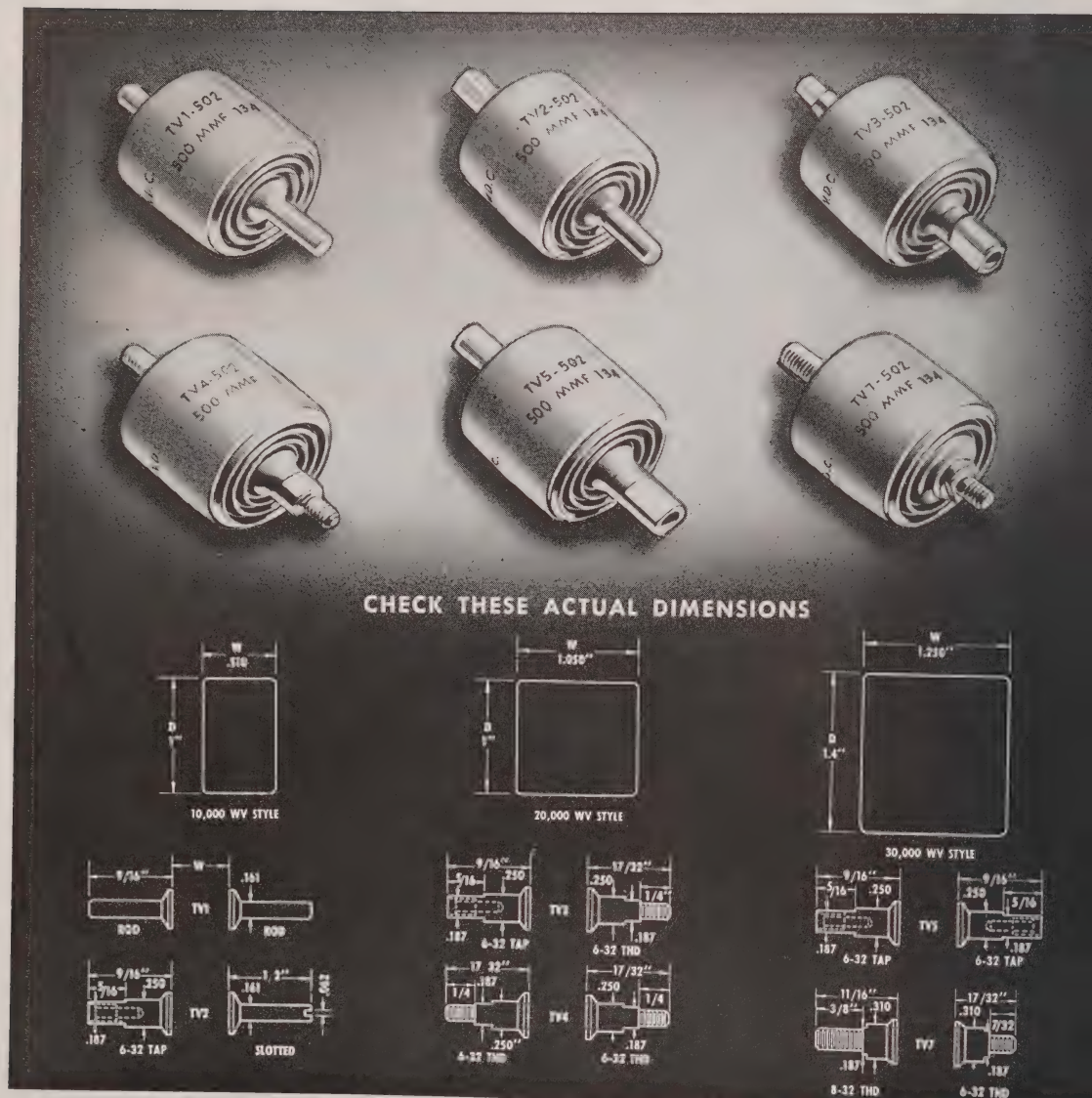

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- **POWER FACTOR** — At 1 MC or 1 KC, initial 1.5% maximum; after 95% humidity, 2% maximum. Returns to initial upon drying.
- **LEAKAGE RESISTANCE** — Initial, 5000 megohms; after 100 hours at 95% humidity, 1000 megohms. Returns to initial upon drying.
- **TOLERANCE** — Minus 20%, plus 50%.
- **BODY SIZES** — 501 (10,000 V.D.C.W.) 1" dia. x .625" long. 502 (20,000 V.D.C.W.) 1" dia. x 1.050" long. 503 (30,000 V.D.C.W.) 1.4" dia. x 1.250" long.
- **TERMINALS** — Brass, cadmium plated. Three combinations available on type 501, 10,000 V.D.C. units. Six combinations on type 502, 20,000 V.D.C. units. Type 503, 30,000 V.D.C. units are available only with 2 type TV1 stud type terminals.

VOLTAGE D.C.W.	CAP. MMF	CRL CAT. NO.	VOLTAGE D.C. TEST	TERMINALS
10,000	500	TV1-501	20,000	2 Rod
10,000	500	TV2-501	20,000	1 Slot, 1 Tap
10,000	500	TV3-501	20,000	1 Tap, 1 Thread
20,000	500	TV1-502	40,000	2 Rod
20,000	500	TV2-502	40,000	1 Slot, 1 Tap
20,000	500	TV3-502	40,000	1 Tap, 1 Thread
20,000	500	TV4-502	40,000	2 Male Thread
20,000	500	TV5-502	40,000	2 Female Tap
20,000	500	TV7-502	40,000	1 8-32 thd, 1 6-32 thd
30,000	500	TV1-503	48,000	2 Rod

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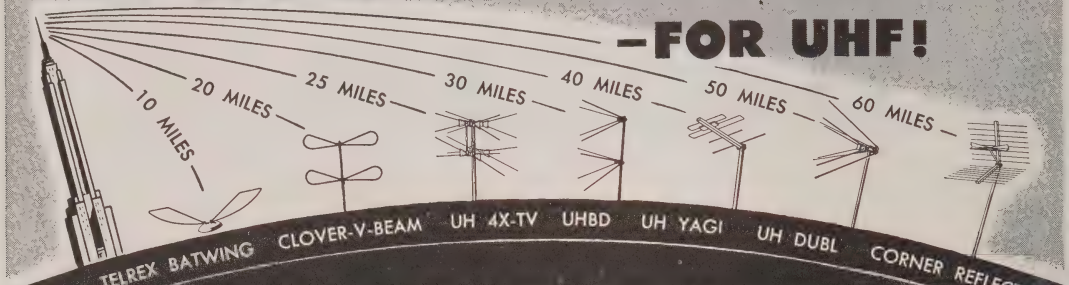

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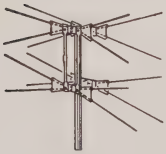

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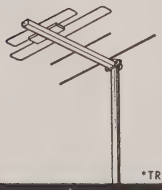

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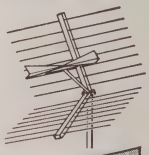

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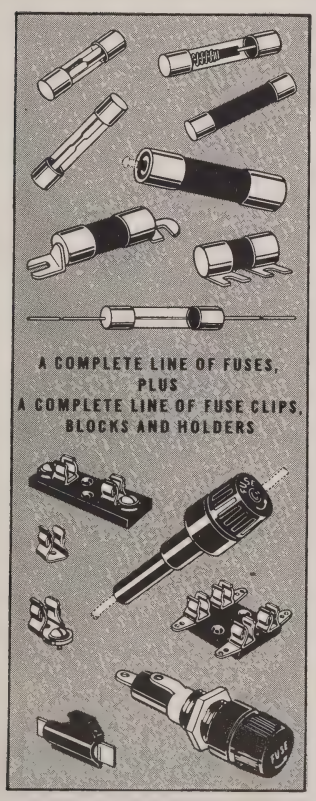

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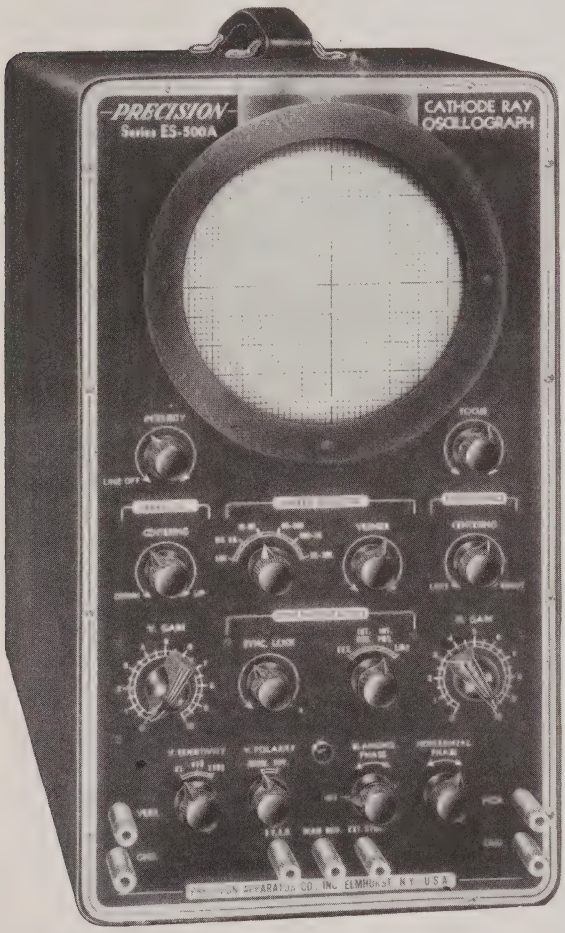

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* **Linear Multi-Vibrator Sweep Circuit**—10 cycles to 30 KC plus line and external sweep.
* **Amplitude Controlled, 4-Way Synch. Selection**—Internal Positive, Internal Negative, External and Line.
* **"Z" Axis Modulation** input facility for blanking, timing, etc.
* **Internal, Phasable 60 cycle Beam Blanking** for elimination of alignment retrace; clean display of synch. pulses etc.
* **Sweep Phasing Control** for sinusoidal line sweep usage. Wide angle bridge circuit.
* **Direct H and V Plate Connections** and Audio Monitoring phone jacks at rear. All four plates accessible.
* **High Intensity CR Patterns** through use of adequate high voltage power supply with 2X2 rectifier.
* **The Circuit and Tube Complement**—6C4 Vertical input cathode follower. 6CB6 first "V" amplifier. 6C4 "V" phase inverter. Push-Pull 6AU6's vertical CR driver. 7N7 first "H" amplifier and phase inverter. Push-Pull 6AU6's horizontal CR driver. 7N7 Multi-vibrator internal linear sweep oscillator. 5Y3 low voltage rectifier. 2X2 high potential rectifier, VR-150 voltage regulator. 5CP1/A CR Tube.
* **7 Four-Way Lab. Type Input Terminals**—Take banana plugs, phone tips, bare wire or spade lugs.
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* **Extra Heavy-Duty Construction** and components to assure "Precision" performance.
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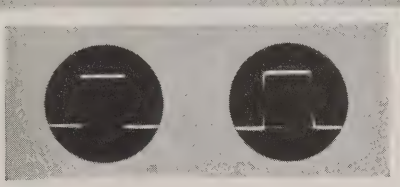

Unretouched photographs of 60-cycle and 50 Kc square waves reproduced on screen of WO-88A. Note fast retrace.

FEATURES—

- Direct-coupled, push-pull, two-stage vertical amplifier; push-pull horizontal amplifier.
- Frequency-compensated and voltage-calibrated attenuators.
- Front-panel source of 1-volt peak-to-peak calibrating voltage.
- Graph screen scaled directly in peak-to-peak voltage.
- Metal shield enclosing CRT gun to minimize hum-pickup from stray fields.
- Extra fast sweep-oscillator retrace.
- Built-in 60-cycle sweep with phasing control.

SPECIFICATIONS—

- Deflection Sensitivity: (vertical amplifier) 25 rms millivolts or better per inch.
- Vertical Amplifier Frequency Response: Flat from dc to 100 Kc; within —3 db at 500 Kc; within —10 db at 1 Mc.
- Input Resistance and Capacitance: 10 megohms and 9.5 uuf with WG-216B Low-Capacitance Probe.
- Sweep-Circuit Frequency (four ranges): 15 cps to 30 Kc.
- Square-Wave Response: Negligible tilt and overshoot.
- Power Supply: 105/125 volts, 50/60 cycles.
- Size 13½" high, 9" wide, 16½" deep. Weight only 25 lbs (approx.).

New WG-216B Low-Capacitance Probe gives the WO-88A an overall input resistance of 10 megohms shunted by less than 10 uuf.

The WO-88A combines the features required for TV receiver servicing, and the high stability and ruggedness essential for continuous production-line duty.

The outstanding feature of the WO-88A is its remarkably true square-wave response, obtained by adequate band-width, negligible phase shift, and a complete absence of peaking circuits. Vertical and horizontal sync pulses, as well as other complex wave forms, are reproduced with fidelity characteristic of expensive laboratory instruments. Furthermore, uniform frequency response is maintained over the entire range of the attenuators.

The two-stage dc vertical amplifier has more than enough gain for all usual applications. Moreover, all of the gain is useable because the input circuits are shielded against extraneous noise and hum right out to the probe tips. Push-pull circuitry in both stages of the vertical amplifier minimizes "line bounce"; and direct coupling provides instantaneous "recovery" time.

For operating convenience, the controls for push-pull balance, astigmatism adjustment, and interstage dc coupling are accessible from outside the cabinet.

Voltage measurements and waveshape observations can be made simultaneously with the WO-88A. A front-panel terminal provides a 1-volt peak-to-peak reference voltage; the green graph screen is scaled in peak-to-peak voltage divisions, which are multiplied by the settings of the step attenuator to determine the voltage.

The WO-88A incorporates other quality 'scope features such as "plus" and "minus" sync, 60-cycle sweep and phasing, and a shield around the CRT gun.

For complete details on the WO-88A, see your RCA Test Equipment Distributor, or write RCA, Commercial Engineering, Section KX56, Harrison, New Jersey. TMK. ®

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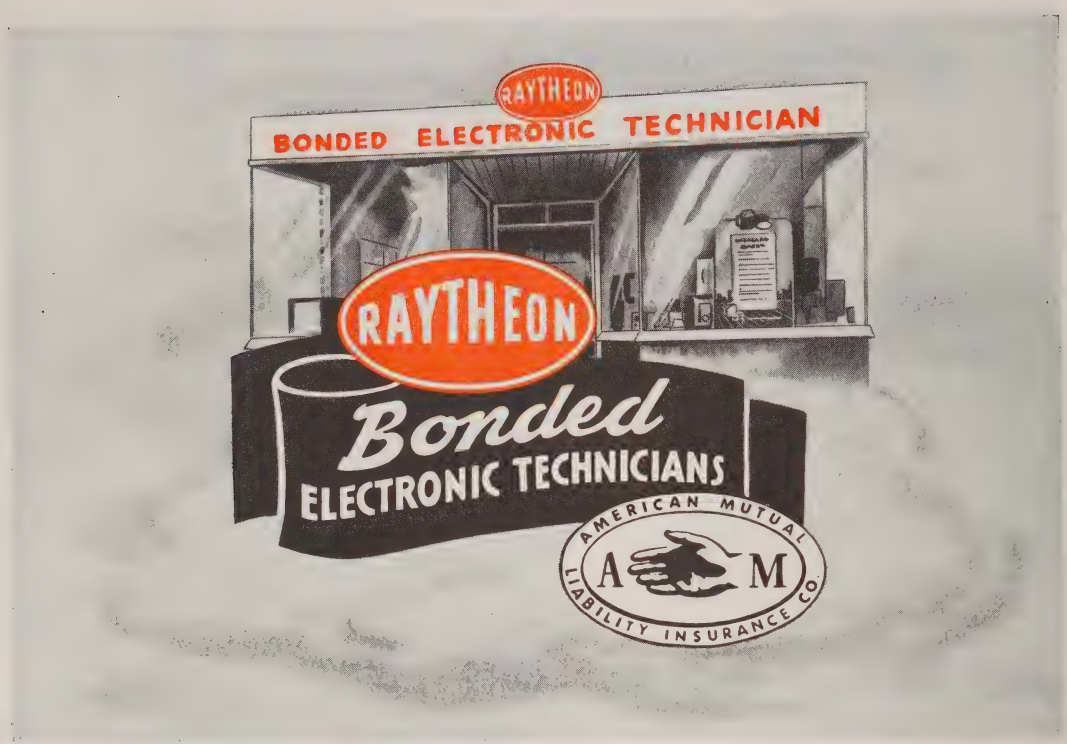

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Audio Marches On

ALTHOUGH, since the days of gooseneck speakers, there has been a fervid audience of ultra-audio enthusiasts, only comparatively recently has the interest become truly contagious and widespread, thanks to the appearance of wide-range speakers, enclosures, amplifiers, cartridges and improved tone arms, needles, motors, as well as highly effective methods of recording.

Service Men everywhere have found that *better music* is no longer the concern of a small circle of fans, as in the early days, but hundreds of thousands of folks. As a result, shops across the nation have begun to stress audio, and feature facilities for complete installation and servicing, as well as custom building. Modernization of old amplifiers and allied phono systems has also proved to be quite an item, prompting many to specialize in conversions.

The fever has even spread to industry associations, who have decided to join the audio parade, and help strike up the band. Recently, in Washington and New York, a joint industry parley was held under the auspices of the phonograph, cartridge and pickup section of the association's parts division to discuss a program which would increase the use of music in the home in all forms. It was generally agreed that industry should campaign vigorously; and members of other associations, including those allied with records, music merchandising, phono manufacturing, and dealer and distributor groups, have indicated that they, too, will beat the drums.

The drive, expected to begin soon, will emphasize the virtues of good music, and particularly hi-fi or *semper fidelis*—always faithful—reproduction, for every home.

Audio has really begun to march on, and with quite a stride!

Horse Sense Public Relations

TV, now on a threshold of a surging era of expansion that will outdazzle all previous spurts in industry, will now more than ever require the mature help of every Service Man, not only in installation and servicing, but technical counselling.

In the thousands of communities where TV will be ushered in for the first time, the advice of the professional Service Man will be sought as a source of expert guidance. The boys will be asked to give their honest opinion on the types of chassis to use, the best design of antennas to select, and what brand of accessories should accompany the installations for the ultimate in listening and looking.

Even manufacturers are beginning to stress the import of the Service Man, advising consumers to see their Service Man for the best advice, noting that Service Men really know what's in a set and what makes it tick.

So that the boys will be very intimate with the inside story of all the chassis in their lines, some manufacturers have begun to expand their clinic sessions, and hold them on a national scale. Recently, one setmaker announced the inauguration of service schools for a hundred centers throughout the country. Featuring three-hour programs, each session offers a demonstration on an actual chassis of the functional, mechanical and operational characteristics of the sets, with special emphasis on circuit arrangements. Pertinent shortcuts pinpointing the exact sources of trouble, as well as earthy advice on how to make the most efficient repairs in the shortest time possible, are also presented.

Alert Service Men, aware of their deep responsibility, have flocked to these clinics, and are reading more intensely than ever the variety of pertinent servicing and circuit information now being published.

TV now presents an unparalleled opportunity to every Service Man. By absorbing the wealth of knowledge now being made available, he can be of formidable service to his fellow neighbors, industry, and himself, too.

UHF Installation and Servicing

WITHIN THE NEXT few weeks, several stations in the east will begin telebeaming their signals on the new high bands, and soon after dozens more will appear on the *uhf* horizon.[1] In view of the immediacy of the new station operations, it will be imperative now to become thoroughly familiar with the specific designs featured in the receivers and converters, as well as the host of accessories that will be used in many instances to receive *uhf* signals.

During the year, there have appeared in SERVICE an assortment of discussions analyzing the circuits and systems employed in many new *uhf* developments. Effective with this issue, this coverage is being amplified, and hereafter, ultrahighs will receive comprehensive treatment in *many* featured articles. To illustrate, in this issue there are four significant *uhf* analyses: *uhf selectors* (page 20); *uhf transmission lines and transmission-line tuned circuits* (page 24); *uhf/vhf master antenna systems* (page 22); and *uhf antennas* (pages 22 and 36).

Next month there will appear details on built-in continuous *uhf* tuners, *uhf* crystals and adapter systems.

It is hoped that you will find these reports interesting and informative. Comments and suggestions on topics for future discussions will be more than welcomed. Trust that we'll be hearing from you.

Five Rules for Success

RECENTLY, a national institute* prepared a list of rules which it was felt their membership should follow to insure professional recognition and firm confidence.

Here they are: One should have an established reputation and be highly regarded in the community. . . . One should be equipped to handle a client's work economically and efficiently. . . . One should demonstrate personal integrity and have a high professional standing, adhering to the spirit and letter of the codes of ethics adopted by many associations. . . . One should keep continually abreast of current developments. . . . Participation in civic affairs should obtain and be attuned to the public interest.

Simple rules, but rich in wise counsel. They should be followed diligently.—L. W.

*With apologies to AIA. [1]See *National Scene*, this issue, pages 31 and 32.

Circuitry and Installation Procedures Evolved for Three Types of Converters Which Provide Single-Channel, Two-Channel and Continuous 70-Channel Coverage‡

[*See Front Cover*]

UHF SELECTORS

by WYN MARTIN

To PROVIDE televiewers with a choice of *uhf* selectors or converters to suit the individual purse and local reception conditions, one manufacturer* has developed three models: a continuous tuned selector[1] providing reception on all of the 70 UHF channels; a unit[2] which can be set up for any two of the 70 channels, the desired one being chosen by a selector switch; and a third[3] for single-channel use. The small size of the single-channel unit (approximately 3½″ x 3½″ x 1½″) permits mounting on the back of a cabinet near the top so that it is readily accessible for switching from *uhf* to *vhf*, and yet is completely out of sight. An attached mounting bracket is provided so that two small holes in the cabinet back cover will mount the unit securely.

Power is obtained from the audio output stage of the TV receiver chassis by means of a tube socket adapter and cable furnished with each unit. Two types of single-selectors are available. One[4] model is supplied with a 7-pin miniature adapter socket and cable for use with receivers which employ a 6AQ5 *af* output stage. Another[5] uses an octal adapter socket for use with 6K6GT or 6V6 *af* output TV chassis.

Since there is considerable variation in the *B*+ voltage at the audio output socket of different models and types of TV receivers to which the single-channel selectors may be connected, terminal boards with several dropping resistors are provided, as shown in Fig. 1. In Fig. 2 appears a chart which tabulates the connections required for different supply voltages.

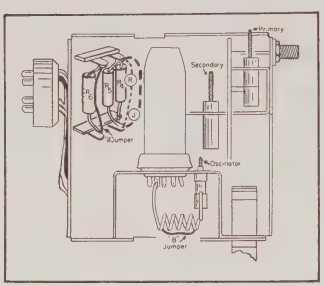


Fig. 1. Layout of selector components, disclosing position of terminal boards and dropping resistors available to accommodate variations in *B* + *af* outputs of TV chassis.

Plate-Heater Requirements

Proper operation can be realized with approximately 75 volts at 10-*ma* drain to the plate of the 6AF4 oscillator tube. The heater power requirements are 6.3 volts at 225 *ma*. (The selectors were designed for use on chassis in which tube filaments are fed in parallel from a 6.3-*v* transformer winding.) Power supply switching is accomplished simultaneously with signal circuit switching by means of a pivoted *T* lever, which operates slide switches on opposite sides of the chassis. This allows for adequate shielding and isolation between the signal and power circuits.

Circuit Description

On the front cover appears a circuit diagram of the single-channel unit. The *uhf* antenna is tapped on the primary of a double-tuned, coupled circuit, and the crystal mixer is tapped on the secondary. This provides the necessary selectivity for the desired signal at the crystal, where it is mixed with the local oscillator, coupled in by means of a resistor from the oscillator cathode circuit, to produce a new sound and picture carrier at the frequencies for channels *5* or *6*. A broadly-tuned coupled transformer, preceded by a low-pass filter in the crystal return circuit, feeds the antenna input of the *vhf* TV receiver when the selector switch is in the *uhf* position. Thus, by adjusting the selector oscillator to produce signals at either channels *5* or *6*, any *vhf* receiver can receive the *uhf* program by tuning it in a normal manner for channels *5* or *6*. The channel chosen should, of course, be the one with the weakest local *vhf* signal. In

*RCA. [1]U70. [2]U2. [3]U1. [4]U1A. [5]U1B.

‡*From notes prepared by* ***John C. Achenbach,*** *Engineering Department, RCA.*

Fig. 4. Chart showing proper positions of jumper on selector and approximate positions of adjustable capacitors for any of the *uhf* channels. Settings at left refer to selector as they appear when received from the factory. At right are settings to be used if factory adjustment has been changed; approximate setting from maximum clockwise end, studs all the way in.

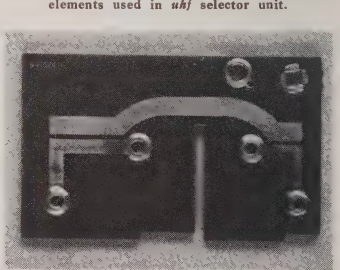
UHF CHANNEL	Approx. Setting of Antenna Primary and Secondary — ROTATE BOTH SCREWS		— OSCILLATOR — ROTATE SCREW		ANTENNA OSCILLATOR	
	left ↶	right ↷	left ↶	right ↷	left ↶	left ↶
14	6.5		1.0		.5	2.0
15-16	5.5		1.0		1.5	3.0
17-19	5.0		2.0		2.5	4.0
20-23	4.5		3.0		3.0	5.0
24-27	3.5		4.0		4.0	6.0
28-32	2.5		5.0		5.0	7.0
33-37	2.0		6.0		5.5	8.0
38-41	1.5		7.0		6.0	9.0
42-44	1.0		8.0		6.5	10.0
45-46	.5		1.0		6.7	2.0
47-50	.5		1.0		7.0	3.0
51-54	1.0		2.0		7.5	4.0
55-60	1.5		3.0		8.0	5.0
61-67	2.0		4.0		8.5	6.0
68-75	2.5		5.0		9.0	7.0
76-82	3.0		6.0		9.5	8.0
83	3.5		7.0		10.0	8.5

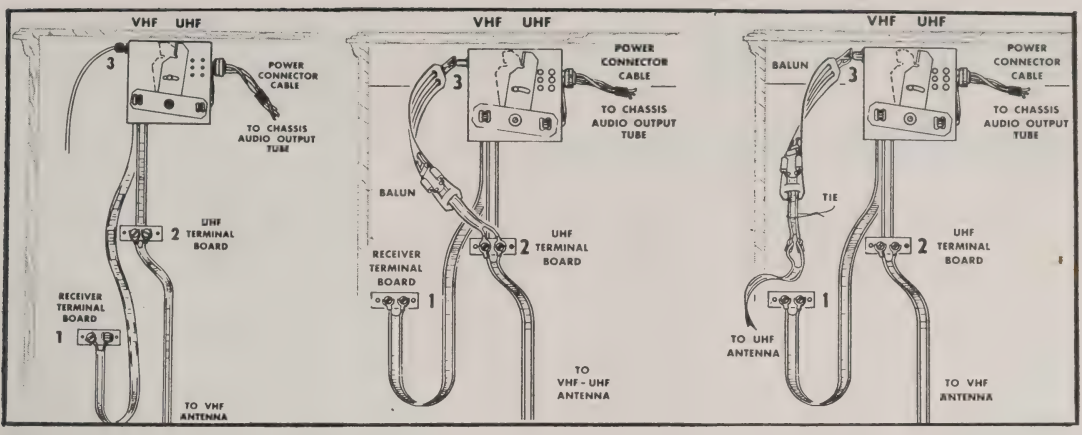
JUMPER "A" AS SHOWN — JUMPER "B" CLIPPED — SELECTOR "A" SHUNTED — SELECTOR "B" SHUNTED

Fig. 2. Tabulation of connections for different supply voltages. Screen voltage of output tube indicated with selector in operation.

Screen Voltage	R6 Jumper	R5 & R4 (as shown)	Add Jumper Ⓙ or Resistor Ⓡ (across R5 & R4)	Additional Resistor Modifications
80	as is	No	(J) Add jumper	None
120	as is	No	(R) 3.3K, 1.0 watt	None
150	as is	No	(R) 6.8 K, 0.5 watt	None
185	as is	No	(R) 15.0 K, 1.0 watt	None
190	as is	No	(R) 18.0 K, 1.0 watt	None
200	as is	No	(R) 22.0 K, 1.0 watt	None
210	as is	No	(R) 27.0 K, 1.0 watt	None
220	as is	No	(R) 33.0 K, 1.0 watt	None
230	as is	No	(R) 47.0 K, 0.5 watt	None
235	as is	No	(R) 47.0 K, 0.5 watt	None
245	as is	Yes	None req'd.	None
250	as is	Yes	None req'd.	None
265	as is	Yes	None req'd.	None
270	as is	Yes	None req'd.	None
290	as is	Yes	None req'd.	None
295	as is	Yes	None req'd.	None
335	clip	Yes	None req'd.	Add 10.0 K, 0.5 watt R across R6
356	clip	Yes	None req'd.	None
360	clip	Yes	None req'd.	None
415	clip and remove R6	Yes	None req'd.	Replace R6 with 2.33K, 2 watt in parallel

Fig. 3. Printed circuit inductance and coupling elements used in *uhf* selector unit.





Figs. 5, 6 and 7. Three arrangements available for different types of antenna inputs. At left, Fig. 5, appear connections for separate 72-ohm coax *uhf* antenna lead and standard 300-ohm *vhf* antenna lead. Center illustration, Fig. 6, shows connections for a common *vhf-uhf* 300-ohm antenna lead. Connections required for separate *vhf* and *uhf* 300-ohm antenna transmission leads are shown in Fig. 7, at right.

rare cases where both channels *5* and *6* may have signals strong enough to cause interference, the oscillator of the selector may be tuned to beat the *uhf* signal down to channel *4*, or even *3* or *2*. The tuning of the output transformer feeding from the crystal mixer is sufficiently broad to accommodate this range, with only a slight deterioration in sensitivity. When the selector is switched to *vhf*, the *vhf* receiver input from the *uhf* selector is automatically disconnected and connected to the *vhf* antenna. In this position the receiver is used in the normal fashion to receive any of the *vhf channels*.

The inductance and coupling elements of the *uhf* selective circuits utilize a printed circuit; Fig. 3. The circuits are tuned by means of adjustable polystyrene capacitors chosen for their low losses at *uhf*.

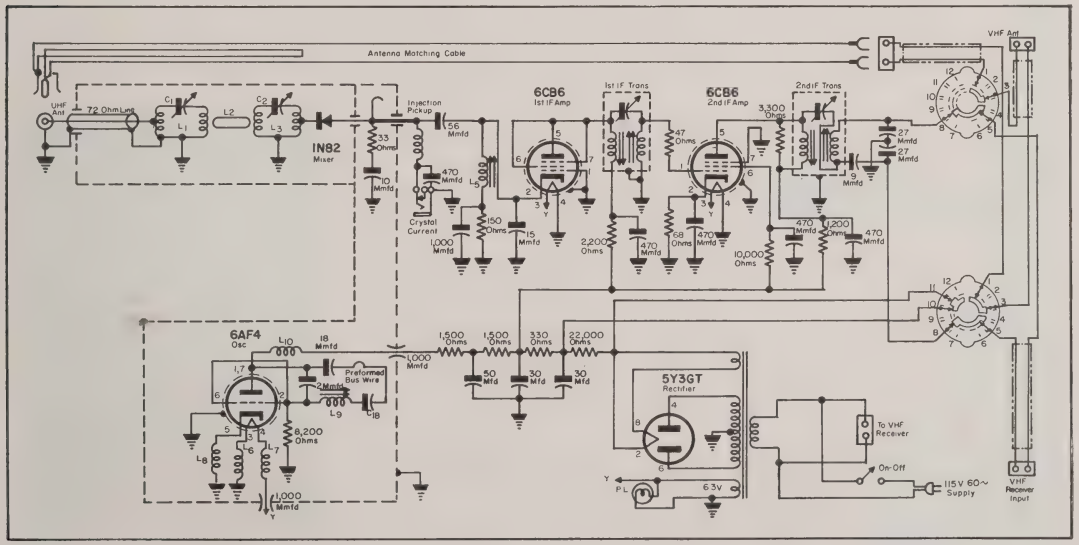
Oscillator Circuitry

The oscillator utilizes a 6AF4 in a modified Colpitts circuit in which the feedback is provided by the internal capacitances of the tube. A simple series tuned circuit is connected between plate and grid. Again, an adjustable polystyrene trimmer is used, but in the case of the oscillator circuit, it is necessary to provide two values of tank inductance to cover the frequency range. This is accomplished by providing a short across part of the tank coil. If the selector is to be used to receive a station in the lower half of the *uhf* spectrum, the short is cut out. The chart of Fig. 4 indicates the proper position of the jumper and the approximate positions of the adjustable capacitors for any of the *uhf* channels.

Antenna Input Flexibility

To provide for flexibility in choice of antennas without requiring additional switching, a crossover network and balun is available to allow the three different arrangements of antenna connections shown in Fig. 5, 6, and 7.

Fig. 8. Circuit of RCA U70 selector, a continuous tuned device providing 70-channel coverage.



UHF/VHF Multi-Outlet System

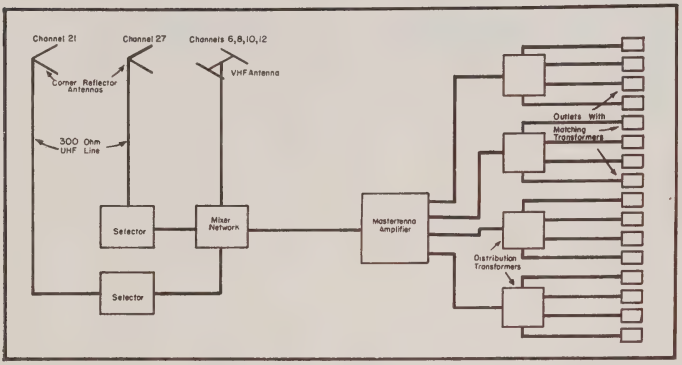


Fig. 1 (left). Layout of the *uhf/vhf* master-antenna system installed at Portland. Although the *vhf* antenna can be attached to any one of the *uhf* masts, as illustrated above, the transmission line carrying the *vhf* signal must bypass the 2-channel selector, and go directly to the mixer. For purposes of clarity this drawing shows the *vhf* antenna on its own mast.

Design and Operational Features of First Ultrahigh-Veryhigh Master-Antenna System Installed in Portland, Oregon

by THOMAS K. BEAMER

When KPTV began the world's first commercial *uhf* television operation in Portland, Oregon, several weeks ago, one enterprising store* was ready for the occasion with a novel *uhf/vhf* master-antenna system. The hookup was placed in operation as soon as the station went on the air.

The antennas and amplifiers were connected up as shown in Fig. 1. In operation, signals from KPTV, channel *27*, are received on a corner-reflector antenna, mounted on a 10′ mast and located at a selected spot on the store's roof, about four and one-half miles from the transmitter, and within line-of-sight. Signal strength has been found to be of the order of 55,000 microvolts per meter.

Signals are fed through 80′ of a new type of 300-ohm *uhf* transmission line, illustrated in Fig. 2, to a 2-channel selector, (*described on pp. 20 and 21*) where it is then converted to *vhf* channel *4*. This channel was selected to eliminate an FM beat note present on the normal channel *5*, and to eliminate the possibility of future adjacent channel interference from channel *6*, which has been allocated to Portland.

To provide for operation with future stations, a mixer was installed after the selector. When channel *21* begins operation, a *uhf* antenna for that station will be installed and the signal will be fed to a similar 2-channel selector, converted to channel *2*, and then fed to the mixer. An antenna for the future *vhf* stations will also be installed, and the *vhf* signals also fed to the mixer. Separate antennas are used to equalize signal strengths fed to the systems.

The mixer is a resistor-matching device in which the values can be readily changed to provide the proper isolation and attenuation to feed equal signal levels to the amplifier. The out-

(*Continued on page 76*)

*Kelly's Appliance Center. [2]System was installed by RCA Service Co. [3]RCA U-2.
**ATV-270, developed by RCA and produced by Anaconda Wire and Cable Co.

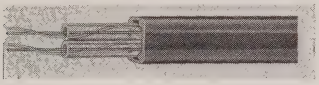
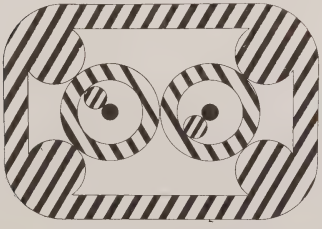
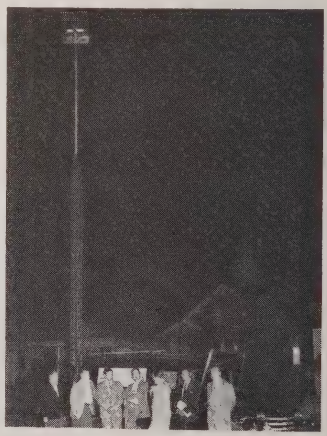


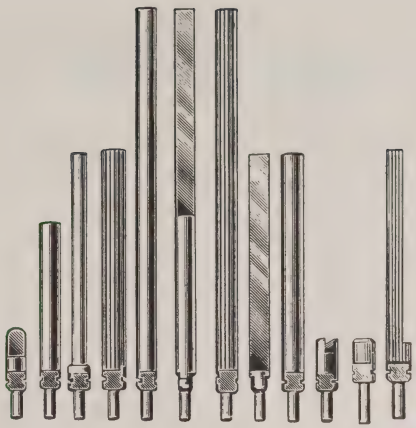
Fig. 2. Views of *uhf* transmission line** which features a *copperweld* conductor, surrounded by polyethylene spiral thread, said to act as a centering medium, allowing the conductor to float within its individual polyethylene tube. Characteristic impedance of the line is 270 ohms; attenuation at 500 mc, 3.6 db/100′, and at 900 mc, 5.1 db/100′. Terminations must be sealed for best results.



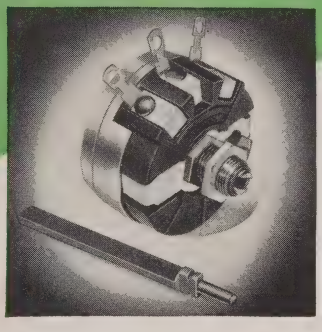
Above, right: Combination *uhf/vhf* antenna on roof of store in Portland. At top of both antenna masts are *uhf* corner-reflector antennas. Lower on mast in background is mounted separate antenna for *vhf* reception.

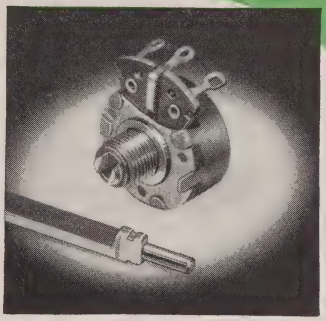
Right: *UHF* test truck which toured Portland, Oregon, during the early morning hours of September 18, measuring TV signals transmitted by KPTV. Photo shows J. P. Boksenbom (third from right), a vice president of RCA Service Company, who supervised the first evening's tests, with several of the company's engineers. The antenna tower at the rear of the truck can be raised to 70′ above street level.





fit the *Right* shaft to the *Right* control—*Yourself!*





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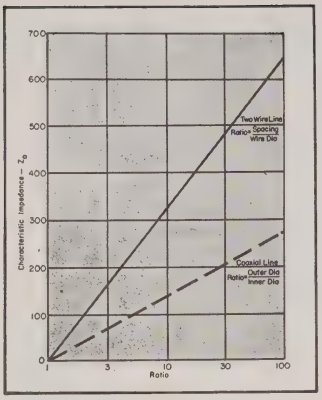
UHF Transmission

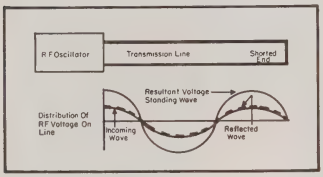
by HENRY R. HESSE

Senior Engineer, TV Receiver Division
Allen B. DuMont Labs



(Above)

Fig. 1. Characteristic impedance of transmission lines with air dielectric.



(Above)

Fig. 2. How an incoming wave and reflected wave combine to produce a standing wave on a transmission line.

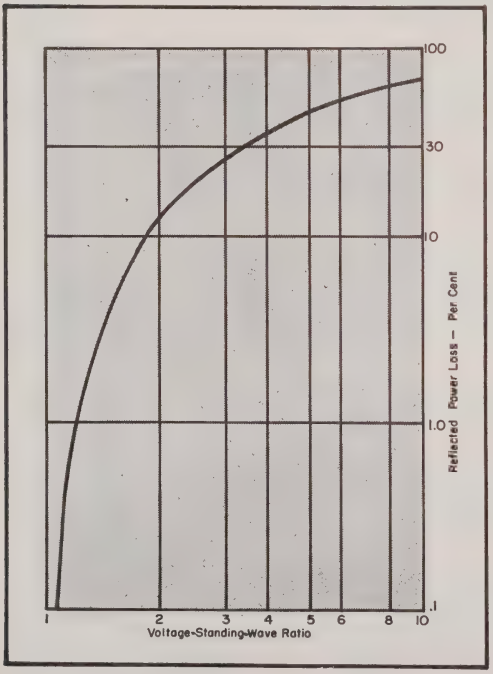
IN VHF TV transmission lines serve only one purpose; to convey a signal from the antenna to the *tv* receiver. In *uhf TV* transmission lines serve two purposes; to convey a signal from the antenna to the receiver and also as tuned circuits.

A transmission line is a means of efficiently transferring *rf* energy from a source to a load, such as from an antenna to a receiver. Two common varieties are available: parallel wire or coax lines. The parallel-wire line consists of two wires maintained at a uniform spacing by means of spaced insulators or a continuous flexible insulating material into which the wires are molded. The coax transmission line conductors consist of one wire imbedded in an insulating material, while the other conductor is an outer solid or woven metallic sleeve over the insulating material.

There are advantages and disadvantages for each type of line. The parallel-wire line is much lower in cost than coax. Parallel-wire line losses are low when dry, but when wet the losses can be much higher. However, coax line losses are higher than parallel-wire line losses when dry, but do not change when wet. Parallel-wire lines usually must be installed in a very careful manner, while coax line is much easier to install. The higher cost of coax line may well be compensated by the easier installation and more consistent performance.

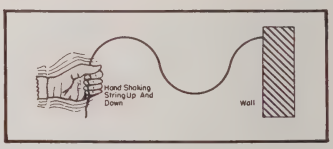
All transmission lines have an important property called the characteristic impedance, which can be defined by the size and spacing of the conductors and the type of insulation used in the line. In general, the characteristic impedance increases if the spacing between conductors increases, if the size of the conductors decreases, or if a material with a lower dielectric constant is used in the line. A graph of the characteristic impedance of both parallel wire and coax lines using air dielectric is shown in Fig. 1. The characteristic impedance is important because it represents the value of the load resistance that will match the line.

Thus far, matching of the transmission line has been stressed. Let us now see what happens if the line is not matched to the load. If the load is not a pure resistance and equal to the characteristic impedance of the line, some of the signal travelling down the line will not be absorbed by the load. The signal that was not absorbed by the load will be reflected back up the



(Left)

Fig. 5. Curve illustrating results obtained when *vswr* is plotted against per cent of reflected power loss.

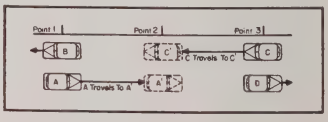


(Above)

Fig. 3. Method which can be used to demonstrate the characteristics of standing waves.

(Below)

Fig. 4. Analogy of cars passing on road, illustrating that autos will pass each other only at certain points on the highway.



Lines and Transmission-Line Tuned Circuits

Characteristics of Transmission Lines When Used Between Antenna and Receiver, and as Tuned Circuits in Ultrahigh Converters and Receivers

line to the antenna and be lost. The combination of an incoming wave and a reflected wave on a line results in standing waves being set up on the line, as noted in Fig. 2; the interaction of the incoming and reflected waves produce addition (*maximum points*) and cancellation (*minimum points*). Another simple experiment to demonstrate standing-wave effects may be performed by anyone with a piece of string, as shown in Fig. 3. The more rapidly the string is shaken the more waves will appear on the string. The fact that the incoming and reflected waves will always cancel at certain points and add at other points on a line becomes apparent from the following analogy. Assume we are in a car riding on a long highway, where cars must maintain a certain speed, say 50 miles per hour, and also that the spacing between cars must be maintained at 1000′. Traffic on this highway proceeds in both directions. It will be noted from Fig. 4 that cars going in the opposite direction will be passed only at certain points along the highway. If we are at *A* when we pass car *B* at point *1* on the road, the next car to be passed will be car *C* at point *2* on the road, our car having moved to *A′*, while car *C* moved to *C′*. Thus cars going in the opposite direction will be passed at intervals of 500′ along the road. And so it is with radio signals travelling along a transmission line in opposite directions at the same time speed. In addition, the spacing between corresponding parts of a wave is determined by the wavelength of the signal. Therefore, the incoming and reflected waves will always cancel at certain points and add at other points along the line.

The ratio of the maximum to the minimum voltage measured along the line is called the voltage-standing-wave ratio or *vswr*. The higher the *vswr*, the higher the reflected power loss of the signal and the greater the mismatch between the line and load. Some idea of the importance of a low *vswr* may be gained from the curve of Fig. 5 showing the per cent of reflected power loss versus *vswr*. A complete understanding of the characteristics of reflection and standing waves on a line is extremely important to a comprehension of how a section of transmission line can be a tuned circuit.

Let us examine a transmission line having a short circuit at its end as shown in Fig. 6. We know that when a high current sometimes flows in a short circuit and blows a fuse, and when a short occurs, the voltage also drops to a low value or zero. The same conditions occur at the shorted end of a transmission line, the current is high and the voltage is low. And because the line is shorted, it will have standing waves along its length. A graph of the voltage along the length of an open line and a graph of current at each point along the length of the line appears in Fig. 7. The minimum points where the incoming and reflected waves cancel are spaced a half wavelength apart, just as in the analogy involving the cars passing at intervals of one half the space between cars. It will be noticed that the maximum current also occurs at points where the voltage is a minimum. From elementary electricity we know that the impedance is the ratio of the voltage to the current in a circuit. Further examining Fig. 7 it will be seen that where the voltage is a maximum and the current is a minimum the impedance is also a maximum. Thus, it can be said that the impedance is a maximum where the voltage is a maximum and vice versa. This property of a transmission line is often used to match impedances by connecting a load, not equal to the characteristic impedance of the line, to a point on the line having the desired impedance.

Now, let us cut off a quarter wavelength of the shorted line under discussion, at point *B* in Fig. 7, and this

(*Continued on page 79*)

Fig. 6. Voltage, current and impedance relations on a short-circuited transmission line.

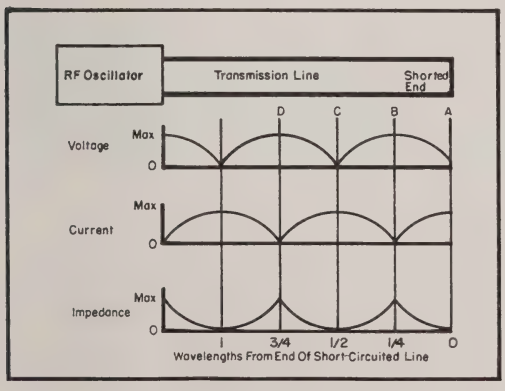
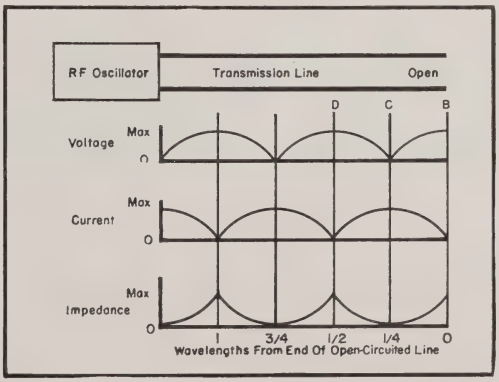


Fig. 7. Voltage, current and impedance relations on an open-circuited transmission line.



Auto Radio Vibrator Tester

by C. T. JOSEPH

Design and Application Features of Instrument Which Can be Used to Troubleshoot Interrupter or Sync, and Shunt or Series-Driven Vibrators

BECAUSE OF THE IMPORTANCE of the vibrator in battery-powered auto radios, Service Men must have quick and effective means for determining the relative operating merit, or quality of vibrators. There are several methods now available to provide such information.* One approach revolves about the use of a complete vibrator tester,[1] whose circuit appears in Fig. 1.

When used in conjunction with a 6-volt *dc* power supply, this device will indicate the *starting* characteristic, input current, and output voltage characteristics of popular and most used 6-volt vibrators. The unit will test interrupter or synchronous, and shunt or series driven vibrators of 100 to 250 cycles operating frequency.

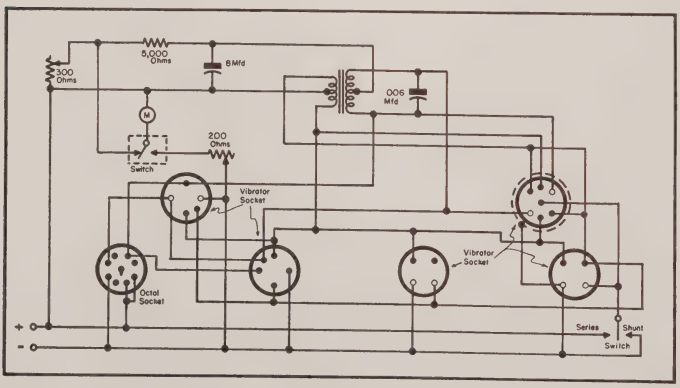
Power-Supply Requirements

The accuracy and effectiveness with which the instrument operates will depend, to a great extent, on the power supply used to furnish the *dc* source for its operation. A fixed voltage such as that obtained from a wet-cell storage battery, or even a semi-variable voltage obtained from a conventional power supply equipped with switch and tapped transformer winding has not been found satisfactory as a supply source. The tester has been so designed that the indicating instrument must be brought to 4-volt and 6-volt terminals to provide an accurate test of the usefulness of the vibrator under test. Consequently, a suitable output must be continuously variable from 4 amperes. Moreover, an ammeter of at least a 5-ampere range should be provided, and with an *on-off* switch in its primary circuit. Such a power supply has been described in SERVICE[2]; January, 1951.

To compensate for either *separate* or *shunt* driven vibrator mechanisms, a circuit change switch has been provided on the panel of the tester. If the character of the driving mechanism is unknown, this switch may be thrown to either position without harm to the vibrator.

*Heller, Solomon, *Auto Radio Vibrator Servicing*, SERVICE; October, 1952. *See Servicing Helps*, this issue, page 46.

Fig. 1. Circuit of the vibrator tester.



When testing interrupter type vibrators, either of four rectifers (6X5GT, OZ4, OZ4A or OZ4G) must be inserted in octal socket. A 6X5 can also be used; in this instance a few seconds warm-up period must obtain before tests are made.

If the indicating meter in the unit fails to operate or indicates a reverse polarity, when testing self-rectifying (reversible) vibrators, it will be necessary to rotate the unit under test 180° and reinsert the vibrator into the vibrator socket. When testing this type of vibrator, no rectifier tube should be in the tube socket.

In testing a vibrator, the input to the tester should be set at a value not exceeding 4 volts. Calibrator button should be depressed and held down, the input voltage being increased slowly until the meter needle coincides with the *start* line. After this adjustment is made, the calibrator button can be released and the ammeter on the power supply studied. A current reading of five or more amperes will indicate that the vibrator is shorted or defective. If the ammeter reading is 2 or 3 amperes, probable vibration is indicated. Of course, if no current flows, the vibrator will be found to be open-circuited. Some current (filament current) will flow at all times when a 6X5 rectifier tube is used to test interrupter type vibrators.

If the vibrator is vibrating, the vibrator should be started and stopped rapidly at least three times by means of the switch in the primary circuit of the power supply. In performing this operation, the voltage control on the power supply should not be changed. A lack of vibration or erratic operation during the start-stop

(*Continued on page 78*)

[1]Mallory 6VT1.
[2]*Auto Bench Power Supply*, Cataldo, J. T.

2 NEW NON-RADIATING LEAD-INS

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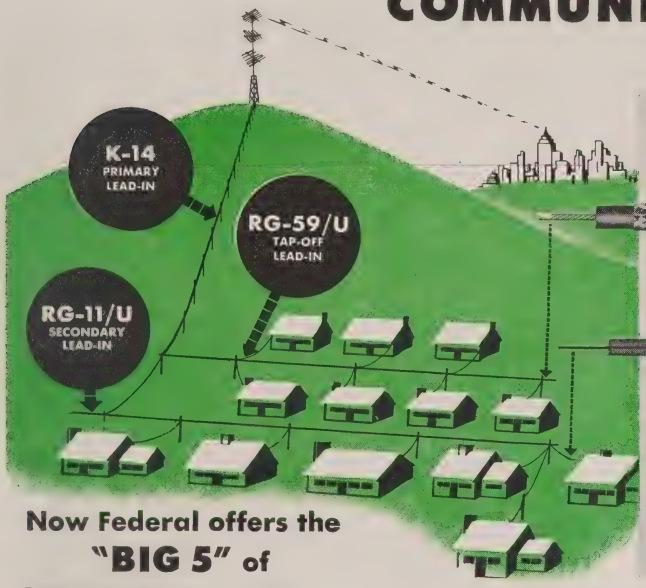

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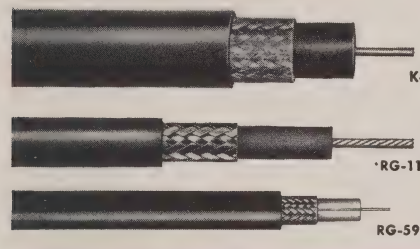

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In Federal's "Big 5" Community TV Systems have the answer to *any* lead-in problem . . . in *any* area! For full information consult your Federal Distributor or write to Federal, Dept. D-256.

Principal Characteristics of Federal's "BIG 5" of Community TV

TYPE	ZO Impedance Ohms	Capacitance per ft. micro-micro farads	DB per 100 Feet				Jacket OD Mils	Weight per 1000 Ft. (lbs.)
			50Mc	100Mc	200Mc	400Mc		
K-14	71	21	.52	.85	1.35	2.6	885	392
RG-11/U	75	20	1.35	2.1	3.1	5.3	415	89
RG-59/U	73	22	2.7	3.8	6.0	9.5	250	36
SP-75	75	20	1.35	2.1	3.1	5.3	470	127
SP-76	73	22	2.7	3.8	6.0	9.5	325	79

America's leading producer of solid dielectric coaxial cables

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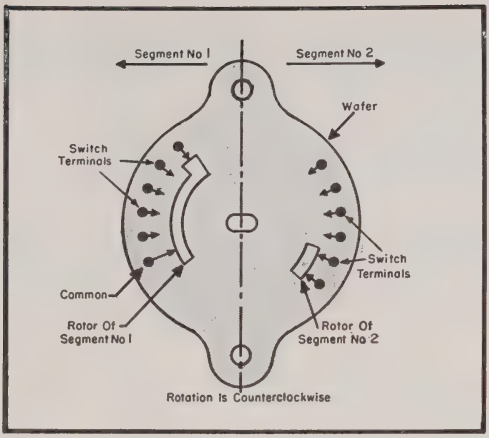


How To Read

Analysis of Common Circuit-Reading Problems Which Stump Service Men and How They Can Be Overcome

(Left)
Fig. 1. Typical wafer switch with two segments.

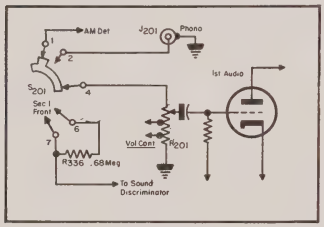
SCHEMATICS are indispensable to the Service Man for they expedite TV servicing by providing such vital information as type of receiver (intercarrier or split sound); type of high-voltage and low-voltage supplies; identity of all stages and their functions; resistance values, against which the resistance of each point to *B*— or to any other point can be checked; in many cases, voltage readings at each pin and, occasionally, the waveforms; and most important, specific interconnections between the various stages.

The last point is often the most useful. Frequently, when there is trouble along a *B*+ or other bus or there is a loss of signal from one point to another, the trouble can be isolated after checking from point to point, with the assistance of a schematic. On the other hand, many Service Men have had the experience of coming to a point of confusion in a schematic, lost in a maze of lines or a switching arrangement or some other difficulty. In such instances, valuable time can be lost.

The most common schematic troubles are: (*1*) Unfamiliar or complex switching arrangements; (*2*) complex connections, through plugs, terminal strips, etc.; (*3*) unfamiliar circuits; and (*4*) confusing diagrams with many criss-crossing lines.

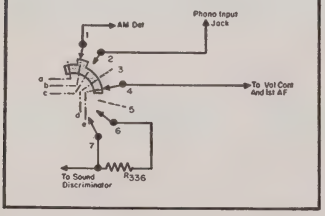
Switching Arrangements

Switching arrangements are the cause of most schematic reading prob-



(*Above*)
Fig. 2. Partial schematic of switching arrangement used in DuMont RA109A, showing the audio switching connections.

(*Below*)
Fig. 3. Switch arrangement of Fig. 2 with dotted lines added to simplify analysis of switch rotation.



Switch Position	Physical effect of switch rotation	Electrical effect of switch rotation
AM	As shown in Fig. 3	Switch terminal *1* (AM detector output) connects to *4* (volume control).
Phono	Point *a* of switch rotor opposite *1* (no contact) *b* *2* (contact) *c* *3* (no contact) *d* *4* (Contact) *e* *5* (no contact)	Switch terminal *2* (phono) connects to *4* (volume control).
FM	Point *a* of switch rotor opposite *2* (no contact) *b* *3* (no contact) *c* *4* (contact) *d* *5* (no contact) *e* *6* (contact)	Switch terminal *4* (volume control) connects to *6*; FM output reduced through voltage divider action of R_{336}.
TV-light on	Point *a* of switch rotor opposite *3* (no contact) *b* *4* (contact) *c* *5* (no contact) *d* *6* (contact) *e* *7* (contact)	Switch terminal *4* (volume control) connects to *6* and *7*; TV-FM output with R_{336} shorted out and there is no voltage dividing action.
TV-light off	Point *a* of switch rotor opposite *4* (contact) *b* *5* (no contact) *c* *6* (contact) *d* *7* (contact) *e* One position past *7* (no contact)	Switch terminal *4* (volume control) connects to *6* and *7*; TV-FM output with R_{336} shorted out and there is no voltage dividing action.

Table 1
Summary of contacts in various switch positions in the DuMont RA109A, illustrated in Fig. 3.

Difficult TV Schematics

by CYRUS GLICKSTEIN

lems. Many of the difficulties in analyzing complex wafer switches are due to the irregular shape of the rotor segments, and by the different methods used to have segments make contact with individual switch terminals on the wafer. To clarify these points, let us study the typical switch illustrated in Fig. 1, and review the functions of the switch parts:

The *wafer* represents one complete deck or layer of a switch. Many receivers use switches with several wafers. The *segment* is a portion of a wafer. A wafer may be divided into several segments; a segment consists of rotor and of switch terminals. Usually, each segment contains connections for its own circuit. In many cases, however, two or more segments may be interconnected.

The *rotor* is that portion of the switch which rotates when the knob is turned. This is usually a conducting metal ring or part of a ring which makes contact with different switch

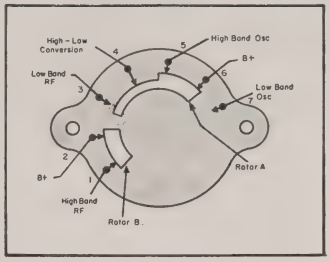


Fig. 4. Numerals and designations of connecting points added to simplify the switching study of the arrangements used in the Stromberg-Carlson TV chassis, shown in Fig. 5.

terminals in the various switch positions. The rotor often has an irregular shape, so that on each switch position it can make the desired connections between terminals.

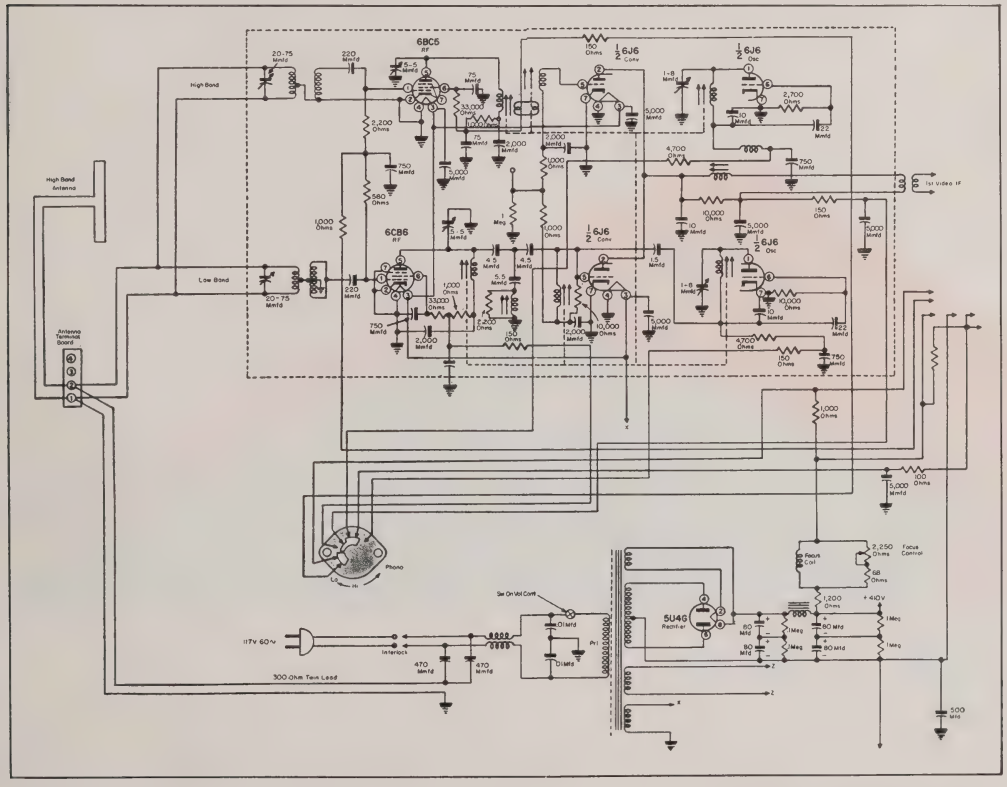
Terminals are the connecting points on the switch. Various parts of a circuit are connected to different switch terminals. The rotor makes contact with two or more terminals to connect them together on a given switch position.

The term *common* is used to describe a switch terminal that makes contact with the rotor on all switch positions. Some segments may not have a common terminal.

In some cases, difficulty in analyzing switching action is due to overlooking or misreading information provided on the schematic. Whenever a switching arrangement is included, *the notes on the schematic should be read carefully.* These notes usually disclose starting position of switch direction of rotation, number of positions on the switch and the function of each position. Usually, in addition to the schematic representation of the switch, a pictorial view is also shown. For example, in Fig. 2 appears the schematic of a single switch segment in a DuMont receiver;

(*Continued on page* 80)

Fig. 5. Partial diagram of Stromberg-Carlson 116-C/116-T, illustrating front-end switching arrangements.



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The **Trombone** provides high gain on all channels VHF and UHF. It is specifically designed for fringe areas.

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SERVICE...The National Scene

PENNSYLVANIA VIEWED AS IMMEDIATE BOOM CENTER FOR ULTRAHIGHS--With the keystone state of Pennsylvania slated to herald the largest crop of uhf stations--10--within the next 6 months, industry will have a bustling new frontier of TV in their charge. Wilkes Barre, Reading and York, as noted earlier, will lead the parade, with York's WSBA-TV promising that it will begin ultrahicasting on channel 43 within a matter of weeks, and WBRE-TV, Wilkes Barre (channel 28) and WHUM-TV, Reading (channel 61) following along. Around Christmas time, Scranton is expected to welcome their station on channel 73, and when the new year arrives, WILK-TV, also in Wilkes Barre, will be on the air on channel 34. At or around this date, WKST-TV in New Castle will also begin operating on channel 45. Next spring, WGBI-TV, Scranton, should begin operations on channel 20; WHP-TV, Harrisburg, is expected to begin TVcasting on channel 55; WNOW-TV, York's second station, will probably be operating on channel 49, and WEEU-TV, the second Reading station, will begin its programming on channel 33.

THIRTY-EIGHT UHF/VHF STATIONS IN 28 STATES ALSO TO TRANSMIT SOON--According to an FCC target-date timetable, the next six months will also witness the arrival of quite an assortment of ultrahigh and veryhigh stations throughout the land. Before the year is out, it is believed that KTBC, Austin, Texas, will begin operation on channel 7; WROV-TV, Roanoke, Va., will be on channel 27; KDEN(TV), Denver, Colo., will begin operating on channel 20; WKAB-TV, Mobile, Ala., will start programming on channel 48, and WJTV(TV), Jackson, Miss., will pull the switch on channel 25. It is also reported that the following stations may be on the air before year end: WSBT-TV, South Bend, Ind. (34); WAFB(TV), Baton Rouge, La. (28); WHYN-TV, Holyoke, Mass. (55); WAKR-TV, Akron, O. (49), and stations in Springfield, Mass. (61) and Flint, Mich. (28) may also begin operations. Between the first of the year and the early summer, the following stations have indicated that they plan to go on the air: WNOK-TV, Columbia, S.C. (67); WEEK-TV, Peoria, Ill. (43); WICC-TV, Bridgeport, Conn. (43); KOLN-TV, Lincoln, Neb. (12); WMAC(TV), Massilon, O. (23); KROD-TV, El Paso, Texas (4); WCOV-TV, Montgomery, Ala. (20); WFTL-TV, Fort Lauderdale, Fla. (23); KCBD-TV, Lubbock, Texas (11); WCOS-TV, Columbia, S.C. (25); KGNC-TV, Amarillo, Texas (4); WPAG-TV, Ann Arbor, Mich. (20); WSUN-TV, St. Petersburg, Fla. (38); WSEE-TV, Fall River, Mass. (46); KTSM, El Paso (9); KHQ-TV, Spokane, Wash. (6); WKNB-TV, New Britain, Conn. (30); WFMJ-TV and WKBN-TV, Youngstown, Ohio (73 and 27, respectively); WSLS-TV, Roanoke (10), and WCEE-TV, Asbury Park, N.J. (58).

OVER 90 NOW HAVE TV CONSTRUCTION APPROVALS--The parade of grants to new stations continues, in Washington. Recently authorized operators include: WFMD, Frederick, Md. (62) ...KEPO, El Paso (13)...KTTS, Springfield, Mo. (10)...KFOR, Lincoln, Neb. (10)...KFEQ, St. Joseph, Mo. (2)...KFDA, Amarillo (10)...WATR, Waterbury, Conn. (53)...WISE, Asheville, N.C. (62)...and WCSC, Charleston, S.C. (5).

UTAH TO BOAST HIGHEST TV TOWER SITES IN NATION--A pair of lofty mountain peaks in the Salt Lake City area of Utah will soon be the home of two TV towers that will be over a mile high in the air. One tower, to be operated by KSL-TV, will be atop 9425-foot Coon Peak, 17 miles west of Salt Lake City; while the other, installed by KDYL-TV, will be on top of Mount Vision, an 8900-foot peak, southwest of the KSL-TV site. It is reported that these new sites will be more than seven times as high as the famous Empire State tower in New York City.

SERVICE...The National Scene

UHF ALL-CHANNEL CHASSIS ANNOUNCED BY SEVERAL SETMAKERS--Three manufacturers have revealed that they have developed 70-channel models, and will begin delivery soon. The announcements have come from two midwest and one eastern receiver manufacturers. One of the midwest lines features manual and automatic-channel selection. The other midwest ultrahigh line features continuous tuning. In the opinion of this manufacturer, uhf will be a dominant factor in '53, and accordingly it has been decided to include uhf tuning facilities in three quarters of the TV sets made by the company. The production plans of the eastern setmaker include models featuring a dual tuner, which will provide for both uhf and vhf pickup. Comprehensive circuitry, installation and servicing analysis of these models will appear soon in SERVICE.

OPS EXPECTED TO ISSUE NEW SERVICING PRICE-CEILING ORDER--A tough OPS price regulation for radio and TV servicing charges, recently approved by the Radio-TV Service Industry Advisory Committee during a meeting in Washington, specifying uniform maximum charges that a service shop will be allowed to charge, may be announced soon. Under the proposed regulation, shops will be obliged to post their ceiling prices, file these ceiling prices with the appropriate OPS district office, and display at all times a list of ceiling prices for consumer inspection. Service Men will also have to carry these listings with them during home service calls, and show them to consumers upon request. The new order will detail certain billing requirements. That is, a shop will have to show on the bill costs of parts, cost of labor, and specify whether any used parts or manufacturer's return parts were used in effecting the repair.

MUNICIPAL LICENSING PROPOSALS ROUTED TO ILLINOIS LEGISLATURE--A resolution, requesting the Illinois state legislature to amend the Cities and Villages Act to permit the municipal licensing of radio and TV Service Men, was approved recently by the Chicago city council, and is expected to be considered during the first session of the next legislature, which meets during the first month of the new year. Hearings will be held shortly after the proposal is submitted, and members of the service industry and others will be invited to comment. If this measure becomes law, hearings will then be held in Chicago to determine whether service licensing is wanted, and if it is, what type of enforcement will be required. TISA's prexy reported that the group is very much in favor of such legislation, and will support the resolution during the Springfield hearings.

HEALTHY '53 RENEWAL-TUBE SUPPLY FORECAST BY NPA COMMITTEE--About 80-million replacement tubes will be produced during 1953, NPA announced during a recent meeting in Washington. And, overall tube production for next year will be in the neighborhood of 487-million units. A substantial portion of the '53 production will be for the military, but the civilian allocation is expected to be sufficient to take care of replacement and initial requirements for an estimated production of some 6,200,000 new television sets and 12-million radio chassis.

MAILBAG APPLAUSE--Writing to ye editor, D. E. Amos of South Bend, Ind., has reported that SERVICE is..."A very fine magazine. I am a recent subscriber who has found more of the detailed and down-to-earth servicing information which really assists in service work in your publication than in a great many issues of competitive material."...And from L. R. Fritze of San Francisco, Calif., has come a note declaring that articles in SERVICE are..."Timely, useful and interesting." We're deeply grateful, gentlemen, for this heartwarming praise.--L. W.

Everybody's talking about the new Pyramid Imp!

All over the country service-engineers are praising the newest and finest molded tubular paper capacitor—the Pyramid IMP!

here's why—

IMPS ARE REALLY RUGGED! The tough thermo-setting plastic will take an astounding amount of abuse—yet IMPS will still look and perform like new!

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Fig. 1. An *if* response curve with usual bandwidth, as displayed on 'scope screen, when the sweep generator provides a zero-volt reference line. No significant information is provided in this instance.

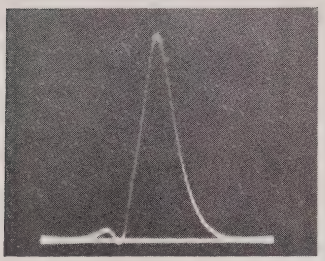


Fig. 2. An *rf* response curve with a very wide pass band, displayed on the 'scope screen when the sweep generator provides a zero-volt reference line. In this case, the peak-to-peak voltage can be measured, and the curve can be *sized up* effectively.

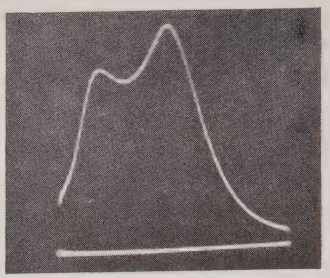
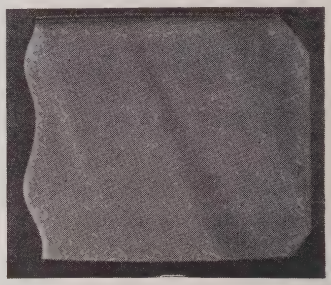


Fig. 3. A raster exhibiting 120-cycle hum. It will be noted that two complete hum cycles appear at the left-hand edge of the raster, which was decentered for observation.



In The Field ‡

WHAT IS THE ADVANTAGE of using a sweep generator with an output which provides a zero-volt reference line?

There is no advantage, unless unusually wideband circuits are to be aligned. In this instance, the peak-to-peak voltage will be apparent, and the curve can be *sized up* better if a zero-volt reference line is provided. Figs. 1 and 2 illustrate this point.

WHEN THE HAND is moved from place to place about the instruments, the response curve keeps changing its shape. What is wrong?

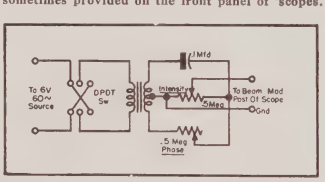
This trouble appears because the instruments are not sufficiently well grounded to each other and to the TV chassis. To cure, all the instruments and the chassis should be placed on a large sheet of metal (a thin insulating sheet may be laid on top of the metal). This provides a counterpoise ground plane; it does not need to be grounded to a water pipe. It is good practice to use a line isolation transformer for all TV test work.

‡*Based on questions posed during meetings conducted by* **R. G. Middleton,** *senior engineer at Precision Apparatus Co., Inc., and author of TV Trouble-shooting and Repair Guide Book, published by John F. Rider.*

HOW CAN A MARKER be made visible on a ratio detector curve?

The marker can be made visible in quite a few cases by opening the stabilizing capacitor during alignment. A more generally applicable method consists of calibrating the base line of the 'scope, as discussed in SERVICE, May, 1952.

Fig. 4. A phasable blanking network for suppressing the retrace during visual alignment. The beam-blanking post provides capacitive coupling to the grid of the *crt* in the 'scope. The *dpdt* switch permits changing of the phase 180°. The 6-volt *ac* source can be derived from a heater transformer, or test-voltage terminal, sometimes provided on the front panel of 'scopes.



HOW CAN ONE TELL WHETHER hum is coming from the power supply, or from heater cathode leakage in a tube?

Power-supply hum is usually 120 cycles, while heater-cathode leakage produces 60-cycle hum. The difference in frequency can be easily distinguished by a trained ear. If the hum appears in the raster, for instance, its nature can be identified by counting the cycles at the edge of the raster. Fig. 3, for example, shows a 120-cycle hum present in a power supply.

IF THE MARKERS are too small on an *if* response curve, what can be done to increase their size?

A more effective system of marker injection can be used. The method which usually provides the largest markers consists of utilizing a floating tube shield over the mixer tube. To keep the sweep signal separate from the marker signal, a split floating tube shield can be employed.

BOTH TRACE AND RETRACE have been found visible during alignment procedures, giving the response curve an annoying double-image effect. What can be done to eliminate this?

The simplest solution is to use a phasable blanking network, as shown in Fig. 4. The *intensity* control should be advanced to obtain satisfactory suppression of the retrace, and the *phase* control adjusted to obtain a uniform brightness of pattern across the 'scope screen.

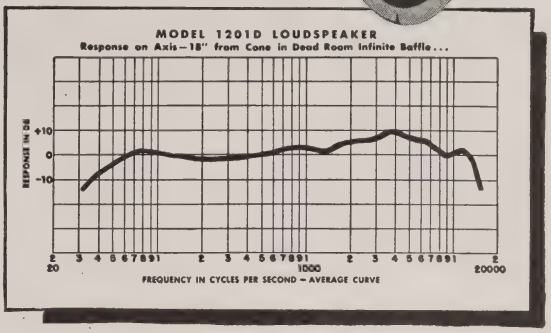
A Monthly Review of Typical TV Problems Encountered During Daily Service Calls and On the Bench: Increasing Size of Markers on IF Response Curve . . . Usefulness of Zero-Volt Reference Line on Sweep Generators . . . Providing Visibility to Markers on Ratio-Detector Curves . . . Detecting Source of Hum . . . Application of Phasable Blanking Networks

Compared with speakers ten times more expensive—many listeners actually prefer G-E Model 1201D

IN recent tests, many un-biased listeners actually preferred the G-E 1201D for its exceptionally fine reproduction! Side by side comparisons at a given volume level were made to try and determine the difference between these G-E speakers and others costing ten times as much.

These General Electric speakers are designed to meet and surpass the exacting standards of performance so essential to high fidelity. Their wide acceptance spells out the answer—for dependability, durability, and all-round superb performance.

Remember, there's a General Electric speaker for every application—27 speaker models in 8 different sizes!



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- **EXCEPTIONALLY WIDE FREQUENCY RANGE**—50 to 13,000 cycles.
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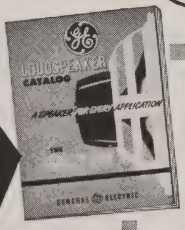

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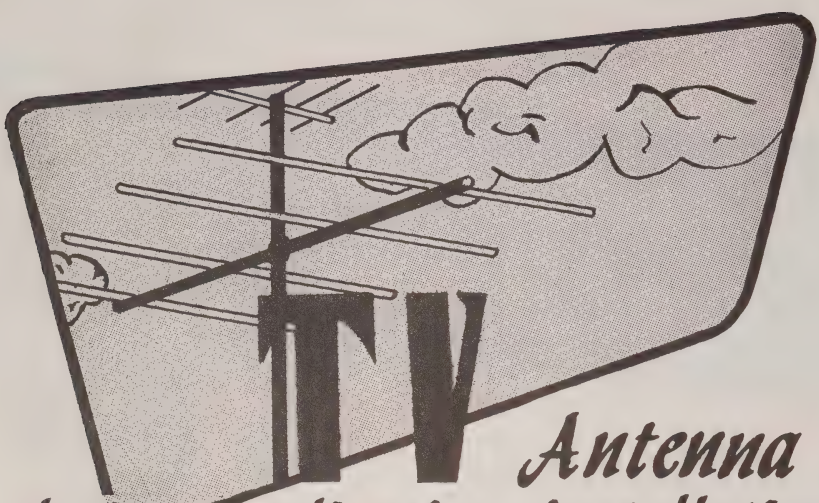


TV Antenna Digest

design..application..installation..service

by RALPH G. PETERS

Analysis of Dipole-Element Diameter Requirements . . . Review of New Products: Multiple Set Couplers . . . Master-Antenna Amplifiers . . . Antenna Selectors . . . Automatic Boosters with Cascode Inputs . . . Reflector-Screen All-Channel Antennas . . . Field Strength Meters . . . UHF Antennas and Installation Hardware

IT HAS BECOME common practice in the antenna industry to utilize dipole elements of ⅜″ diameter aluminum tubing. It is also not uncommon to find a variety of antennas fabricated with elements of ¼″, 5/16″, and up to ½″.

Because of this wide assortment of aluminum element diameters, there has appeared an impression among many Service Men that additional gain can be obtained from the antenna as the diameter of the rod increases.

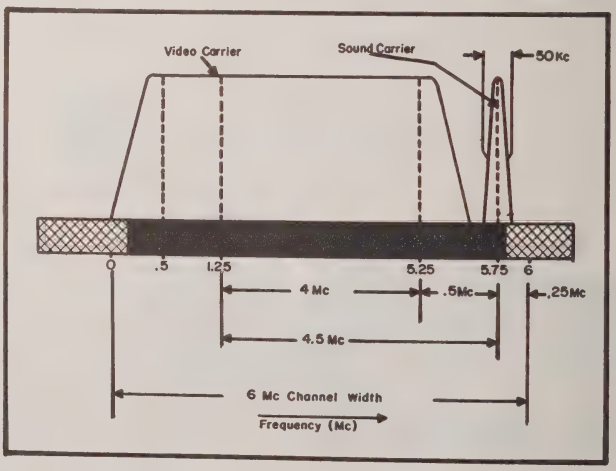
The primary function of the diameter of the aluminum element is to determine the bandwidth per channel. Tests in the lab of one manufacturer* have indicated that ⅜″ is about the

(*Continued on page* 86)

*RMS.

Response plot illustrating bandwidth effect of ½″ and ⅜″ elements. Solid bar drawn represents bandwith obtainable, using ⅜″ antenna elements. Crosshatched extension of the bar indicates the increase in bandwidth afforded by use of ½″ elements.

(Courtesy RMS)



Sub-fringe *TV* booster which is said to provide a gain of 26 db on high band and 34 db on low band. Features an improved cascode input circuit wtih a noise factor of 7 db. Fully automatic. Has wide-band (automatic) tuning, on-off relay, separate high and low-band input, independent gain controls for each band, and bypass switch. *(ITI-90AB; Industrial Television, Inc., 369 Lexington Ave., Clifton, N. J.)*

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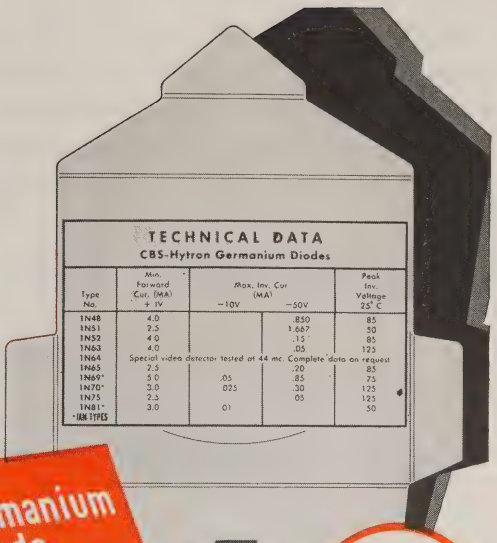
CBS-Hytron guarantees its new germanium diodes *moisture-proof* . . . trouble-free. Germanium wafer is soldered directly to the base . . . no plating to flake. Universal design follows joint Army-Navy specifications. You can clip or solder these diodes into circuit. Ten popular CBS-Hytron types are ready for you. See your CBS-Hytron jobber. Or write direct for catalogue and interchangeability chart.


TECHNICAL DATA
CBS-Hytron Germanium Diodes
Type No.
Min. Forward Cur. (MA) + 1V
Max. Inv. Cur (MA) −10V
Max. Inv. Cur (MA) −50V
Peak Inv. Voltage 25° C
1N48 4.0 .850 85
1N51 2.5 1.667 50
1N52 4.0 .15 85
1N63 4.0 .05 125
1N64 Special video detector tested at 44 mc. Complete data on request
1N65 2.5 .20 85
1N69* 5.0 .05 .85 75
1N70* 3.0 .025 .30 175
1N75 2.5 .05 125
1N81* 3.0 .01 50
*JAN TYPES

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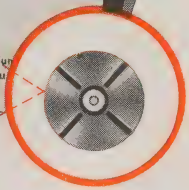
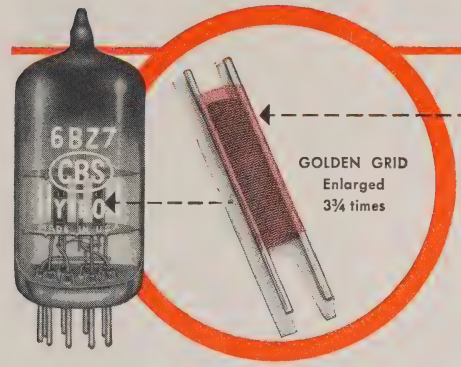


Permanent X molded into end of case marks connection to germanium . . . which corresponds to cathode of vacuum tube.



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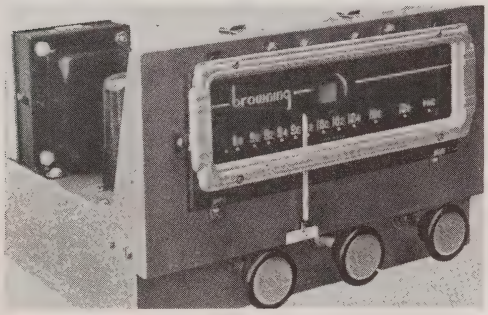
Practical Solutions to Problems Encountered in Connecting Up Tuners . . . Factors Which Must Be Considered: Gain and Impedance Matching, Tone Controls on Tuner, Tuner Hum and Other Sources of Noise, Antennas

TUNERS In HI-FI Systems



by MARK VINO

Fig. 1 (above). FM tuner which features an all-triode *rf* section and follows the Armstrong receiving method with dual cascade limiters for noise quieting. Input signals of 3 microvolts will produce 20 db of quieting. The *afc* locks the local oscillator into correct tuning and may be switched off if desired. A selector switch permits FM, phono, TV, or recorder playback to be fed through the tuner volume control to the main amplifier. Chassis is 11" wide, 9⅜" deep, and 6½" high. A 15-kc audio output is said to be available and fed through a cathode follower output stage at low distortion; less than 0.25% at 25-kc modulation swings. Long cable runs are claimed to be possible at the low impedance output without affecting *hf* response. Tube complement includes two 12AT7s, one 6J6, five 6AU6s, one 6AL5, a 5Y3 rectifier and 6AL7 tuning indicator. Has a self contained power supply and *ac* power outlets at the rear of the chassis to facilitate powering turntables and amplifiers. (*Model RV31; Browning Laboratories, Inc.*)

TUNER CHASSIS are theoretically purely *rf* affairs, consisting of a front end, *if* amplifier stages, and detector circuits. Commercial tuners, however, almost universally include volume and channel selector controls, and often provide one or more low level stages of audio amplification. The special problems associated with connections of the tuners may therefore be quite varied with different models. The solutions to these problems are not as automatic as is occasionally thought, and improper handling can result in faulty operation.

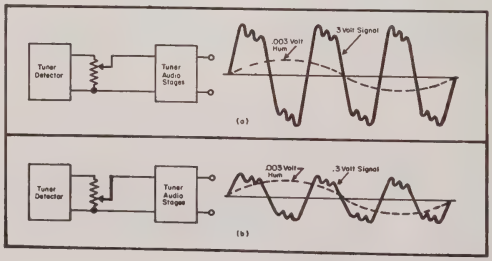
Gain Matching

The strength of the output signal available from the tuner is rated in terms of *rms* voltage. This rating determines the required power sensitivity of the amplifier; the number of input signal volts needed for full amplifier output. If the tuner provides sufficient audio gain and contains its own tone controls, it should be connected to a fixed gain basic amplifier (a type included in the equipment lines of various manufacturers), in which case the tuner volume control automatically furnishes the proper input signal voltage.

A more typical combination of equipment will have volume controls on both the tuner and the audio amplifier. One control should be set permanently and the operator of the assembly provided with a single knob labelled *volume*. Normal procedure is to adjust the amplifier volume to a fixed point and use the tuner control for operation. The adjusted amplifier gain should be such as to have a comfortable amount of reserve for weaker signals, but no more. The proper setting may be found by tuning to the weakest station that affords a good quality signal, and with the tuner gain all the way up, setting the amplifier control for reasonably loud reception.

If the amplifier has too much gain various undesirable conditions may be encountered. One of the most apparent of these may be a high hum level which is not affected by the tuner volume control. This control is ordinarily located before any tuner stages of audio amplification, so that the absolute value of the audio hum component in the tuner signal is always the same. With full signal strength the hum component represents a satisfactory signal-to-hum ratio, but with too much amplifier gain the tuner radio signal must be attenuated, changing the ratio. Since turning the volume control of the tuner almost all the way down leaves the hum voltage

Fig. 2. How too much amplifier gain can decrease the signal-to-hum ratio. The tuner gain control must be turned almost all the way down to avoid blasting, but the hum output of the tuner's audio stages remains the same.



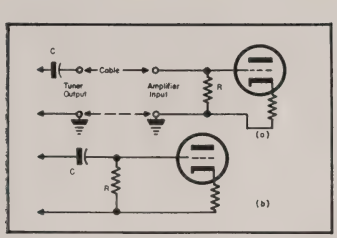


Fig. 3. Voltage divider effect between tuner coupling capacitor and amplifier input impedance. If the amplifier input impedance is lower than the design calls for, the bass frequencies can be severely attenuated.

unchanged, the signal-to-hum ratio may become intolerably high, as illustrated in Fig. 2.

Amplifier-Gain and Quality

Another possible result of too much amplifier gain is a degradation of quality, caused by the unfavorable circuit conditions often associated with a tuner potentiometer which is just *cracked* above zero. It is also very inconvenient for the operator of the set to find that he can only turn his volume control a few degrees before the speaker begins to blast.

One of the grave mistakes occasionally made is to connect the tuner to a high gain microphone input channel, usually with unfortunate consequences.

Impedance Matching

The tuner manufacturer's specifications relative to impedance matching should be carefully followed. With a few exceptions the modern commercial tuner has a high impedance output, and the normal ½-megohm input of the amplifier potentiometer provides a proper match. A few tuners have an output circuit which allows an amplifier input impedance as low as 30,000 ohms; this is an advantage since high frequency losses are avoided in the connecting signal cable. (When the cable is short these tuners work satisfactorily into the standard ½-megohm input.) Other tuners are so designed that an input impedance less than a half-megohm should never be used.

There are two possible adverse results from using too low an input impedance. The first is that the amplifier input may actually form part of the *ac* load impedance of the AM detector, as it does in certain models, and low values will cause distortion. The second is that low-frequency losses may occur because the coupling capacitor in the tuner output circuit does not have sufficient capacitance for the new circuit conditions. Fig. 3 illustrates the effective voltage divider formed by the coupling capacitor and input resistance, a voltage divider which will introduce low-frequency attenuation if the value of the resistor approaches the value of the capacitor reactance within the audio frequency range.

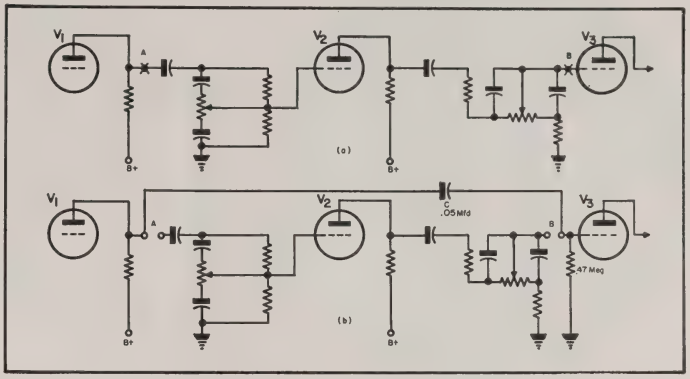
Low-Impedance Jacks

Some amplifiers provide for a 500 or 600-ohm line input in addition to the standard input. The low-impedance jack must never be used unless the tuner provides a special output circuit of similar impedance characteristics.

Tone Controls on the Tuner

Certain tuners have complete tone-control circuits allowing independent boost or cut of either bass or treble. If these circuits are duplicated in the amplifier, operation will be confusing if all of the controls are operative.

Fig. 4. Method of bridging typical tone control stages. The circuit is broken at the points marked *A* and *B*, and V_1 is coupled directly to V_3 through a new coupling capacitor *C*. Since the treble control itself formed the grid resistor of V_3, a new 47,000-ohm grid resistor is added.



Tone-Control Bridging

The tone control stages of the amplifier used with such a tuner may be bridged, or shorted out as far as the signal channel is concerned. A typical operation of this type is illustrated in Fig. 4. If the Service Man does not wish to rewire any of the units, the controls of the amplifier can be fixed in one position and left that way permanently. The best position at which to set the controls is not necessarily the *flat* one. An opportunity is presented for the equalization of frequency response deficiencies in other components of the assembly, at least in some measure. For example, a loudspeaker with high-frequency losses may dictate setting the amplifier treble control at partial treble boost, leaving the tuner treble control to compensate for varying program conditions.

Tuner Hum

There is a type of hum which is associated exclusively with *rf* circuits, called *modulation* or *tunable* hum. It can only exist when a station carrier, either AM or FM, is tuned in; it is coupled between *rf* stages as an intermodulatory product between the low

(*Continued on page* 82)

Fig. 5. A 300-ohm ribbon lead FM antenna.

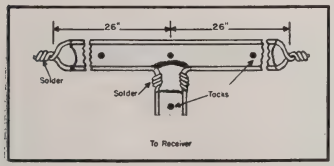


Fig. 6. Sensitivity standards for FM tuners.

	Excellent	Good	Fair	Poor
Quieting sensitivity (average over band)	15 mv	50 mv	100 mv	140 mv
Maximum sensitivity (average over band)	7 mv	25 mv	50 mv	70 mv

TUBE News

by L. M. ALLEN

Sensitive VTVM Design Using 12A4 Medium-Mu Triodes*. . . CRT Dynamic Analyzers . . . Picture Tube Boosters

CONVENTIONAL VTVM's have been found to utilize seldom the full sensitivity possible from the tubes employed, because of the unbalance, instability, and lack of linearity inherent in operating these tubes at the high plate currents necessary for high sensitivity.

This problem obtains because of the nature of the bridge circuit used. In an elementary bridge circuit we have four resistances arranged in series parallel, as shown in Fig. 1. The potential difference across the bridge is expressed by the equation:

$$\Delta E = E_{in}\left(\frac{R_2+\Delta R}{R_1+R_2+\Delta R}-\frac{R_1}{R_1+R_2}\right)$$

As indicated in Fig. 2, the curve ΔE versus R_2 shows that as R_2 is increased, ΔE approaches 0 volts asymptotically** and maximum ΔE occurs at $R_2 = O$. This indicates that to obtain high sensitivity in a bridge circuit which uses vacuum tubes for two of the arms, the tubes must have very low *dc* resistance or a low tube drop at their operating point and, in addition, dissipation ratings sufficiently high to allow them to be operated with low resistance plate loads.

A recent survey has disclosed that the 12A4,‡ while primarily intended as a vertical output tube in TV receivers, can be used in *vtvm*'s because

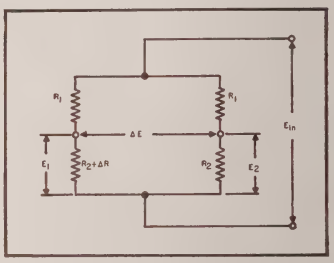


Fig. 1. Basic resistance bridge used in *vtvm*.

of its high perveance and uniformly small grid current, and provide sensitivities up to 15 times that of conventional tubes and circuits. In Fig. 3 appears a circuit[1] in which higher sensitivity resulted through the use of 12A4s.

The low-value cathode resistors used were found to allow each tube to pass

(*Continued on page* 93)

*Based on Hytron commercial engineering report.

**Point of contact recedes indefinitely along infinite branch of curve.

‡Hytron high perveance medium-mu triode.

[1]Pat. Pending.

Fig. 2. Curve which illustrates the fact that high sensitivity can be obtained in a bridge circuit which use tubes in two of its arms, if the tubes have low *dc* resistance or a low tube drop at their operating point.

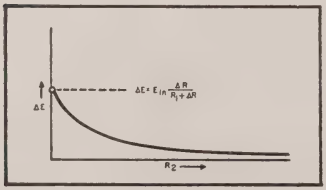
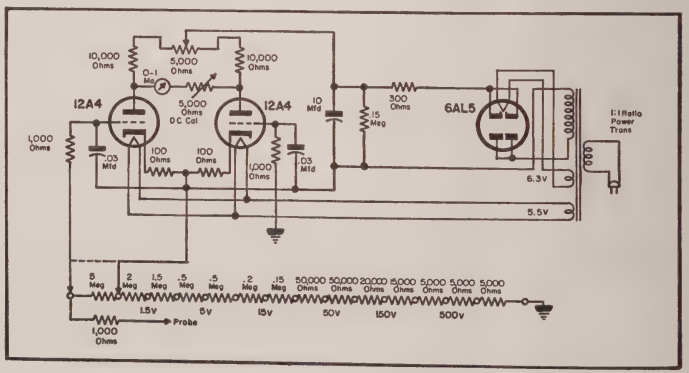


Fig. 3. A basic *dc* bridge circuit using 12A4s. Only the *dc* portion of the circuit is shown since this is the basic foundation of most *vtvms*. Peak-to-peak or *rms* reading diodes for *ac* scales and an additional divider for ohmmeter scales can be added to this circuit.



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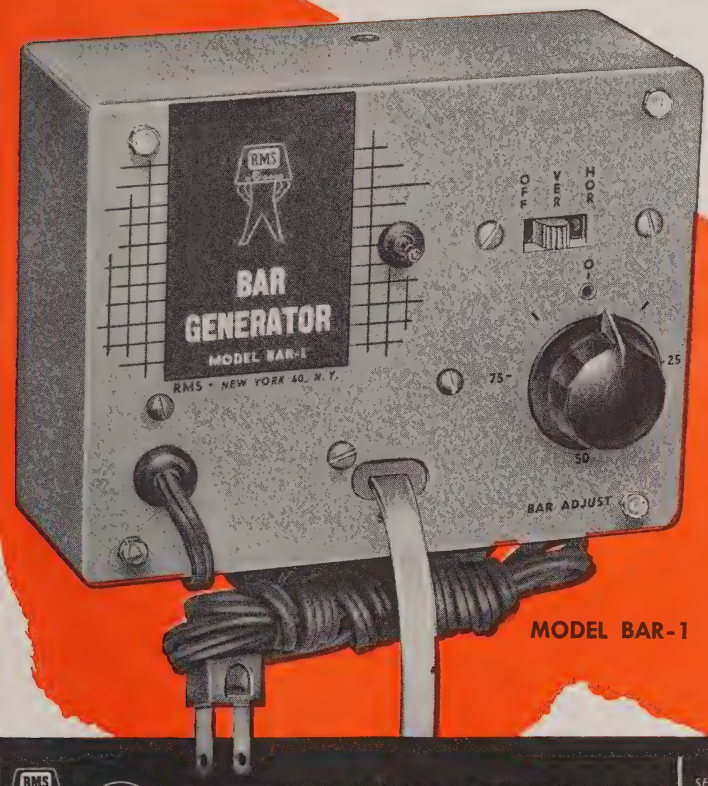

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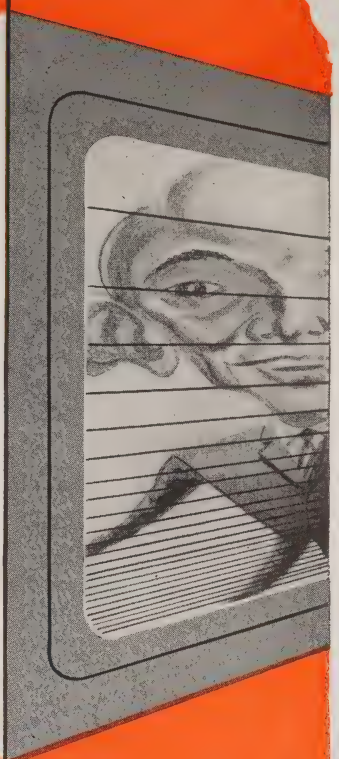

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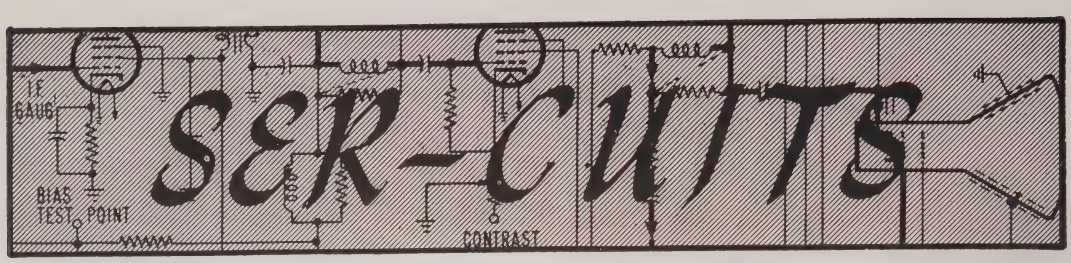


by M. W. PERCY

RF/AF/TV Market Generator Circuitry . . . Semi-Self Biasing Systems in Portable Receivers . . . Twin-Diode Detectors in TV Chassis

MARKER GENERATORS, which have become increasingly important during the past few years, are particularly interesting instruments with many novel circuitry features.

In the circuit of one marker,* Fig. 1, provisions have been made for *rf, af* and TV applications.

In this circuit, V_1, in the first four positions of switch S_1, is a straightforward Colpitts oscillator, but in the last position, the tube becomes a modified Colpitts-ultra-audion type of oscillator. The Colpitts circuit was selected because it offered an inherent high stability. In the *hf* oscillator are four coils, L_6, L_{6A}, L_{6B} and L_7, included to take advantage of the internal tube capacities to generate high level signals at 110 mc. The frequency range of coil L_1 is from 300 kc to 1 mc; coil L_2, from 1 to 3 mc; coil L_3, from 3 to 10 mc; and coil L_4 from 10 to 30 mc. The combined coils of the *hf* oscillator provide a 30 to 110-mc range on fundamentals. Each of the first four coils are permeability tuned. The *hf* arrangement is tuned by adjusting coil L_5. Capacitors C_3 and C_4 are trimmers which compensate for the distributed capacity of the circuit and the two-gang variable, C_1 and C_2.

Resistors R_1 through R_7 are loading and stabilization resistors. They serve to keep the overall output of the oscillator to a fairly level amount as the instrument is switched from range to range. The signal from the oscillator tube is capacitively coupled from L_7 to the grid of a cathode-follower output stage; V_2. From V_2 the signal is attenuated by potentiometer, P_1, and then fed to a stepping attenuator comprised of $R_{13, 14, 15, 16, 17}$. The signal is then fed through C_9 to an output jack.

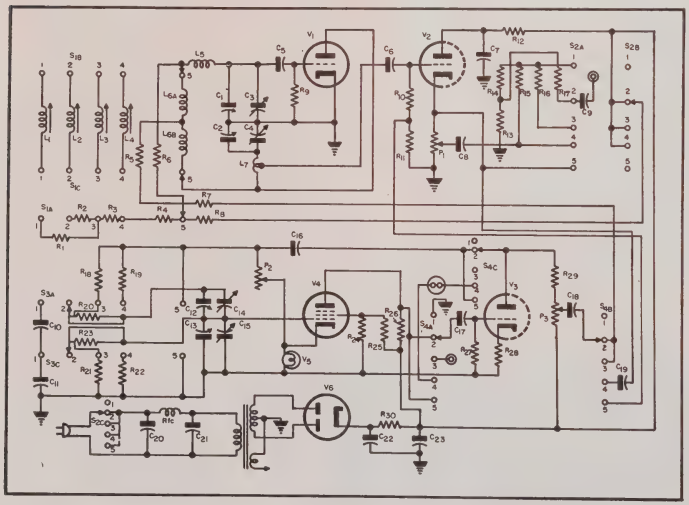
In the switch $S_{4A, B}$, and C position shown, V_3 and V_4 are in a Wien bridge. The signal from V_4 is amplified and phase-shifted to the plate of V_3. From V_3 the signal is fed back through C_{16} and through R_{18} and R_{20} and C_{12} and C_{14} to the grid of V_4. From the grid of V_4 the signal passes through C_{13} and C_{15} to ground, and also through R_{23} and R_{21} to ground. If all phase angles are taken into consideration, it will be noted that the voltage on the grid of V_4 is in phase with any initiating voltage. The signal is also fed through C_{16}, through P_2, and onto variable resistor, V_5. Since V_5 is connected to the cathode of V_4 the voltage across V_5 is inverse and therefore tends to act in a degenerative capacity. At one particular frequency, the signal through the resistor and capacitor combination, previously described, will overbalance that fed through P_2. The V_4-V_3 combination will, therefore, oscillate at that one frequency.

P_2 serves to adjust the waveform of the output signal, since it varies the amount of inverse feedback. R_{29}, shown unbypassed, reduces distortion effects of V_3. R_{29} is used to reduce the capacity effects from P_3, a variable audio-output control. The signal from P_3 is capacitively coupled through C_{18} and through R_7 in such manner that it plate modulates oscillator tube V_1. This modulation is kept down to within 30% to reduce frequency modulation.

The power supply is of the conventional full-wave variety with a *pi* type *lc* filter in the *ac* line.

When switch S_4 is thrown into position *5*, the signal from C_{18} is fed through switch S_{4B} to the junction of R_{10} and R_{11} and finally to the grid of V_2 through R_{10}. From the cathode of V_2 the signal is fed to position *5* of

Fig. 1. Circuit of Precise 630 *rf/af*/TV marker generator.



*Precise model 630.

‡Based on notes supplied by ***Melville Byron*** of Precise Development Corp.

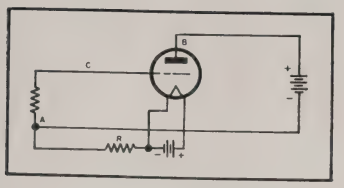


Fig. 2. Basic circuit of semi-self bias system used in Philco portables.

S_{2A}; from here it goes through C_9 to the output jack. In that same position S_{2B} is changed to position *5*, which automatically disconnects the *B*+ voltage to the *rf* oscillator tube, thereby placing it in a standby position.

The output audio signal is controlled by P_3, and P_1 is, at the same time, essentially removed from the circuit. This arrangement was found to simplify operation, and also serves to maintain a constant cathode-follower output impedance.

When S_4 is placed into position *3*, the grid of V_3 is connected to an external modulation jack. The external modulation is therefore amplified and developed across R_{29} and P_3. The voltage across P_3 is fed to S_{4B} (*3*) and from there up through R_7, which plate modulates the oscillator tube, V_1, through a decoupling resistor, R_7. By using V_3 as an amplifier, it is possible to externally modulate the *rf* oscillator with low level signals, as might normally be developed by a microphone or a crystal phono.

If S_4 is now rotated to position *4*, the grid of V_3 connects through C_{17} and S_{4A} (*4*) to the crystal jack; the plate of V_3, by means of S_{4C} (*4*) also connects to the crystal jack. This then becomes a crystal oscillator, where the output voltage is developed across P_3. Since S_{4B} is now in position *4*, the signal from P_3 is fed through C_{19} up to the cathode of V_2. The combined *rf* signal from V_1 and the crystal signal from V_3 will then be found across P_1. At this point the signals are mixing in a linear device (a resistor) and therefore do not beat. In addition, the adjustment of P_1 varies the amplitude of both the *rf* and the crystal simultaneously, and maintains the same ratio between crystal output and *rf* output, regardless of the setting of P_1. This is unique since it is not necessary to readjust either the crystal or the *rf* output as the potentiometer P_1 or the stepping attenuator, S_{2A}, is varied.

The oscillator tube is not only resistance, but grid and plate stabilized against frequency drift.

To prevent 60-cycle pickup or other extraneous signals from interfering with the audio oscillator, a shield has been included. This was necessary since high impedances are used in the audio circuit.

The audio section is continuously variable from 20 to 40, 40 to 200, 200 to 2,000, and 2,000 to 20,000 cycles. The *rf* output voltage is approximately 1 to 2 volts at 110 mc and the audio voltage is approximately 3 to 4 volts output. The *rf* output impedance is maintained essentially constant at approximately 72 ohms for all positions of the stepping attenuator, S_{2A}, and is fed into a 72-ohm coaxial cable. All output connectors are coaxial type to maintain both impedance match and *hf* output.

Semi-Self Bias Circuitry**

In the lab and in the field, it has been found that the individual power consumption of groups of good tubes of the same type may vary over a rather wide range when used in identical circuits. It has also been noted that an increase in current drain, over the normal average, does not give a sufficient increase in power output to make the additional battery drain worthwhile. With tubes displaying low drain, however, it has been found advantageous to raise their current consumption to about the normal average. With the aim of holding power consumption within closer limits that is ordinarily possible with fixed bias and to prevent lessening of battery life caused by high current drain, a novel semi-self bias system has been devised for Philco portables, models 53-656 and 53-658.

The basic circuit of this system is shown in Fig. 2. It will be noted that

**From data appearing in the *Philco Serviceman* bulletin.

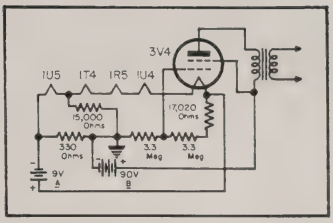


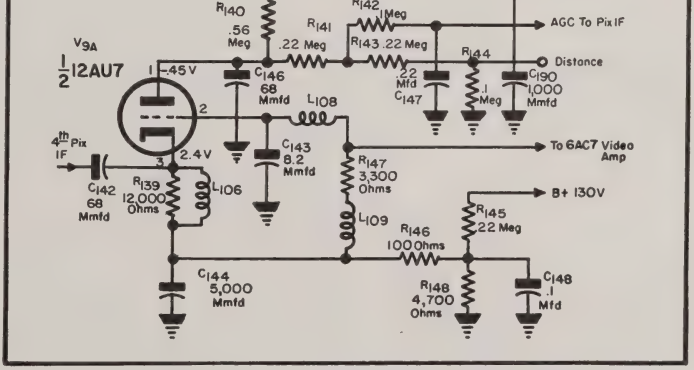
Fig. 3. Schematic of biasing system used in Philco 53-656 and 53-658 portable receivers.

the current flow through the tube, from *A* to *B* to *A*, will cause a voltage drop across *R*. The voltage at *A* will be equal in value to the drop across *R* and will be negative in polarity. This negative voltage will also appear at the grid, *C*, as bias. If the current drain of the tube increases, the current through *R* will increase, raising the value of the negative potential at *A*, thus raising the bias voltage at *C* and lowering the current flow through the tube. The reverse is true, in that, a decrease in current flow through *R* will lower the bias and allow an increase in output current. This action is not caused by audio current fluctuations, but is established by average or static current conditions in battery operation only.

The circuit used in the portable models is shown in Fig. 3. Switching has purposely been omitted for reasons of simplicity. The 330-ohm resistor is in the negative leg of the *B* supply and the voltage drop across it is a function of the total *B*-current drain of the set. Since the output tube is responsible for a great percentage of this current, it may be considered as merely a function of the 3V4. The

(*Continued on page* 91)

Fig. 4. Detector section of Arvin TV chassis in which a 12AU7 serves as a twin diode. See p. 91 for circuit analysis.



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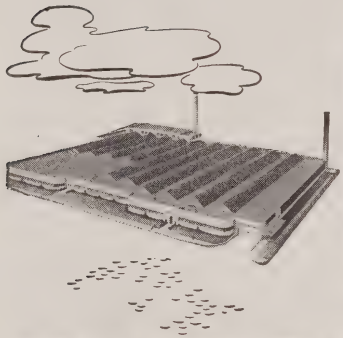
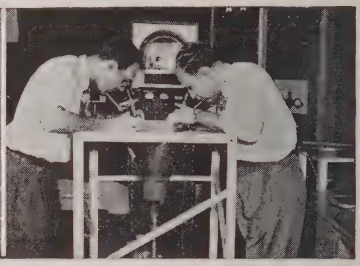
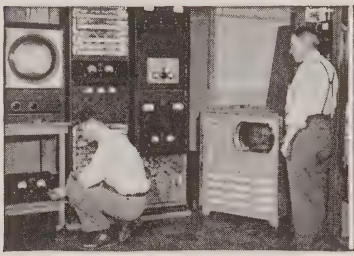


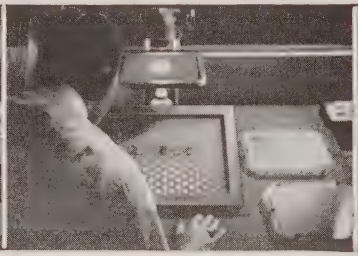
Rubber model for studying electron optical designing—basis for Rauland's exclusive Indicator Ion Trap.



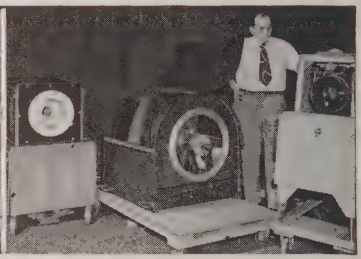
Alignment of the screen and parallax mask of tri-color tube containing approximately a million fluorescent dots.



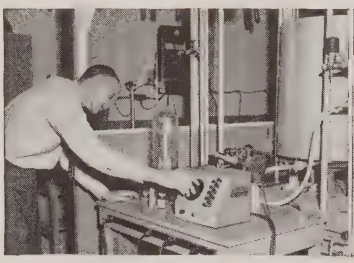
All-electronic tri-color tube in electronic receiver system (left) in comparison with mechanical system (right).



Inspection and checking of perforations .0075" in diameter in masks of tri-color picture tubes.

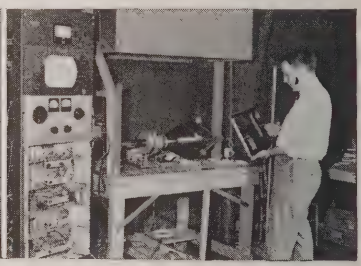


Rauland large-screen projectors using three different optical systems, all of which give theater-size pictures.



Careful study of the formation of thin metallic films in a vacuum . . . basis for the aluminizing of tubes.

Examination with polarimeter permits careful control of strains for superior glass-to-metal sealing.



A physicist using a Rauland-developed radiation meter in checking X-ray radiations from cathode ray apparatus.

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Servicing Helps

Power Transformer Checks in Auto-Radio Vibrator Systems[1]... Noise-Cancellation Circuit Adjustments... Providing Sufficient Horizontal Sweep Width in Low-Line Voltage Areas... Critical Horizontal-Hold Circuit Modification...Eliminating Dark Spots in Center of 21-Inch Picture Tubes...Improving Vertical Hold Range . . . Increasing Sound in Fringe Areas . . . Retrace Line Elimination

by M. A. MARWELL

IN SERVICING AUTO RADIO vibrator systems,* the checking of power transformers is particularly important. It has been found that many vibrator failures have been due to defects in the transformer, shorted turns appearing in a part of the windings of the secondary so that in effect only half of the power transformer is operating normally. This is reflected back to the vibrator through the contacts of the vibrator carrying more of a load.

The total secondary resistance is normally 850 ohms; thus one-half of the secondary resistance would be approximately 425 ohms.

Low-Resistance Problems

One section may read 420 ohms and the other 430 ohms; this slight difference in the resistance may occur due to the style of winding and should not be taken as the cue to trouble. But, if one half of the secondary reads as little as 300 ohms, an investigation is then in order. For, in this case, during the half cycle when this part of the secondary is in operation, there will be a heavy current drain. This will tend to accelerate the breakdown of vibrator contact points. Where the secondary has a fixed short, detection is simple because if the normal current going through one set of the contacts is 5 amperes it may now be 8 amperes. The difficult faults of this type to locate are where there are swinging shorts, not immediately apparent due to the high current or change in resistance value. Sets suspected of having this trouble should be allowed to operate on the bench for some time to reach maximum operating temperature, with an ammeter in the *A* supply, and a voltmeter measuring the output voltage. Bouncing the set on the bench or tapping the power transformer during this time may reveal intermittent shorts, with momentary indication of increased current drain and lower *B* voltage.

Noise Cancellation Circuit Adjustment

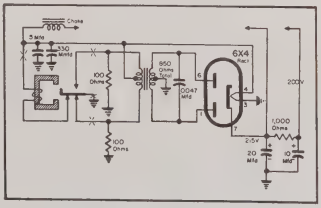
Stromberg-Carlson 421 model television receivers coded 52-30-1 or later incorporate a circuit development known as *noise cancellation.* All chassis having this circuit can be readily identified by an additional potentiometer to the right of the phono switch on the rear chassis flange labeled *Noise Cancellation Control.* This control must be properly adjusted to realize full value of the noise canceling circuit. When the *noise cancel* control is in its extreme counterclockwise position, the noise cancellation circuit is ineffective; when it is in its extreme clockwise position, the cancellation circuit will clip sync and picture and cause a dark picture with no sync action.

To adjust the *noise cancel control* all picture adjustments, size, linearity, etc., should be made with the *noise cancel control* in its extreme counterclockwise position. After all picture adjustments are made, the strongest signal in the area should be tuned in and the *noise cancel control* advanced slowly clockwise until the picture starts to lose sync; then the control should be backed off until the picture is stable.

*Heller, Solomon, *Auto Radio Vibrator Servicing,* SERVICE; October, 1952.

[1]Based on service notes prepared by Philco.

Fig. 1. Philco auto-radio vibrator circuit, illustrating how secondary winding defect in power transformer can cause vibrator failures.



Insufficient Horizontal Sweep Width in Low-Line Voltage Areas

Some early production Motorola TS-324A chassis have been found to lack sufficient horizontal sweep to completely fill the screen at low line voltages. These early chassis were not equipped with the raster corrector magnets.** To obtain an increase in horizontal size a pair of corrector magnets can be installed. Because the chassis use a metal cone picture tube, it will be necessary to use a shield over the magnets to prevent corona. The addition of these magnets will, in most cases, remedy the trouble. In these earlier sets, it was found that the 6BQ6 tubes used suffered a rather rapid deterioration which aggravated the size problem. A redesign of the high voltage transformer has resulted in eliminating the size problem as well as resulting in an increase in high voltage. It is, therefore, recommended that the type 6BQ6s used originally, should not be used in TS-324 chassis which are coded TS-324A-03 or earlier. The TS-324 chassis, coded TS-324A-04

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The two Solders that Kester offers for your use, "Resin-Five" Core Solder and Plastic Rosin-Core Solder, have a valuable feature with which you should be familiar . . . the many diameters or strand sizes available.

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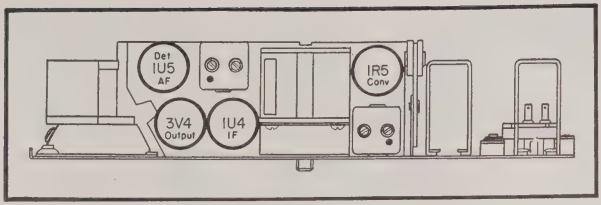

Fig. 2. Correct tube designations in RCA personal receiver.

and later, use the new transformer which eliminates both the width and tube problem.

Loose B Batteries in Personal Receivers

In some cases, replacement *B* batteries for RCA personal models will be found to vary slightly in mechanical dimensions. The battery may not fit snugly and may, therefore, rattle under certain conditions. By placing a rubber band at each end of the *B* battery, mechanical rattle will be materially reduced when the instrument is moved or carried.

Tube Layout Change

In a small quantity of RCA 2B400 personal receivers, the positions of the 1U5 and 3V4 tubes were shown incorrectly on the tube label in the cabinet back, the tube designations being interchanged. The correct tube layout is shown in Fig. 2. Corrections to the original label, if needed, may be made to prevent possible confusion at some later date when tube replacements are made.

Critical Horizontal Hold Correction

Many cases of critical horizontal hold in Stewart-Warner TV chassis have been found to be due to an increase in the value of the 3,900-ohm resistor (*258*) in the plate circuit of the 6SN7GT horizontal multivibrator tube. This is a ½-watt 10% tolerance resistor, and in the event that its ohmic value should increase considerably, the horizontal hold action of the receiver will be critical. The 270,000-ohm resistor (*263*) in the plate circuit of the other triode section of the 6SN7GT horizontal multivibrator will also contribute to this condition if its value should increase. Both of these resistors should be checked when this fault is encountered.

Dark Spot in Center of 21" Tube

On certain Stewart-Warner 21" TV models, there have appeared round dark spots, approximately 4" in diameter, on the center of picture tubes. This has sometimes been erroneously analyzed as being an ion burn. Actually, this dark spot has been found to be present because the picture tube is too close to the safety glass. An electrostatic discharge to the glass reduces the high voltage on the picture tube in a small area, and the dark spot results. To remedy this situation, the chassis mounting bolts should be loosened, and the chassis back slid as far as it will go. If there is any question that this spot might be an ion burn, the chassis should be removed from the cabinet, noting whether or not the dark spot appears.

Vertical Hold Range Improvement

In some Stewart-Warner TV chassis, Service Men have found that the correct electrical setting of the vertical hold control is somewhere near the end of its range. To compensate for this, the 2-megohm resistor (*223*) in the grid circuit of the 6BL7GT vertical blocking oscillator tube has been changed to 1.8-megohms. The 9210 series chassis which incorporate this change include the letter *C* in the series designation stamped on the back of the chassis.

Increasing Sound in Fringe Areas

In some fringe areas, an increase in sound level on Admiral 22A2, 22A2A, 22Y1 chassis can be obtained by detuning the 19.75-mc adjacent video channel trap, L_{108}. When adjusting the fine tuning control on the receiver for best picture in fringe areas, the video *if* carrier moves to a higher position on the *if* curve and the sound carrier to a lower position. This places the sound carrier very near the frequency of L_{108} and causes attenuation of the sound level. Therefore, by detuning the trap, the sound level can be increased. The L_{108} slug should receive about 7 or 8 turns or until no further increase in sound is apparent.

Ingenious soldering technique developed at CBS-Columbia television plant in Brooklyn to overcome soldering smog. Rebending of blades serves to pull the soldering fumes away from the operator's nose. Suction action is accomplished in this manner. Simple hardware cloth has been found to give more protection than an ordinary fan guard.

Improving Vertical Interlace

Wide spacing or pairing of raster lines in Admiral 21 and 22 series chassis is an indication of improper vertical interlacing. In some instances, pairing of the raster lines may be caused by incorrect setting of the vertical hold control. Inserting a .05-mfd capacitor across R_{407} (8,200 or 10,000 ohms) in the vertical output stage will improve vertical interlacing and add to the stability of the circuit.

In addition to the foregoing change, a 330-mmfd capacitor inserted from pin *1* of the vertical oscillator tube to ground should be tried. This will also improve interlacing by improving synchronization of the vertical oscillator.

Bending of Picture

Picture bending with changes of contrast control setting in Admiral 21 and 22 models will be found to be usually a result of improper sync separation due to variations in picture transmission. This variation can be compensated for by lowering the sync separator plate voltage; R_{417} should be reduced to as low as 10,000 ohms, depending on the severity of the bend.

Increasing Width

In some Admiral 21 and 22 series chassis, particularly where the line voltage is incorrect, it may be necessary to increase or decrease the picture width. Changing the size of C_{421} (.1 mfd) to .05 mfd will increase width. Increasing the value of C_{421} to .5 mfd will decrease the width.

Retrace Line Elimination

Retrace elimination by means of fixed values has often proved unsatis-

**Motorola part numbers for magnets, complete with shield, are 1V721584 for right-hand assembly and 1V721585 for left-hand assembly.

Extra profits for servicemen!

NOW you can add UHF to the thousands of VHF Super Fans presently installed in your area, with Channel Master's exclusive new Ultra-Dapter, Model No. 414. In 5 minutes you can convert any Super Fan into an all-channel VHF-UHF antenna. See your distributor for details.

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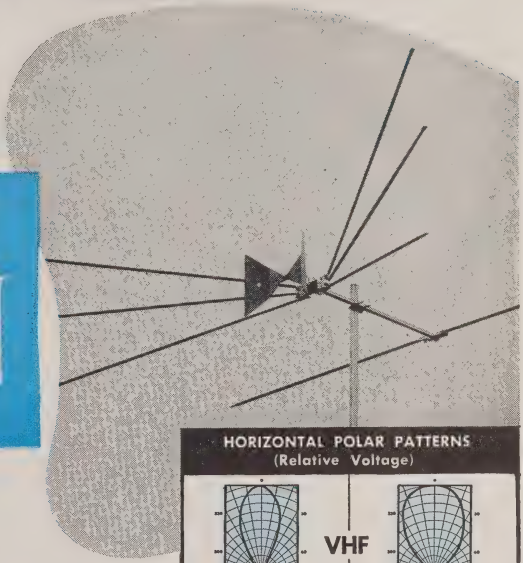

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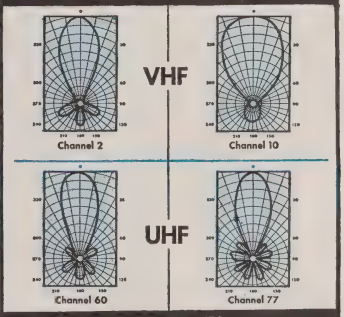
Today's most advanced ALL-VU* antenna.

*All VHF, All UHF

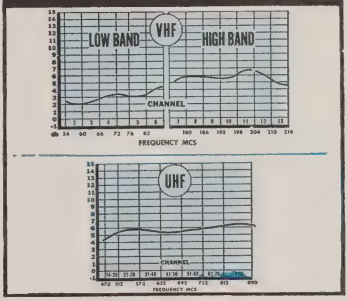
Featuring:

- **2 great antennas in 1 —** A genuine, high gain Super Fan on VHF, and an all-channel Triangular Dipole and reflector for peak UHF reception.
- **Electronic inter-action filter —** Automatically isolates VHF and UHF bands, eliminates inter-action. Ultra Fan operates with only a *single* transmission line to TV set.
- **"Free space" terminals —** Channel Master's *exclusive* UHF "free space" terminals prevent accumulation of dirt and moisture which gradually reduce picture quality in ordinary UHF installations.
- **Famous Channel Master engineering —** The Ultra Fan is an *integrated* VHF-UHF antenna that give uniformly high gain over *all* TV channels, from 2 through 83.

HORIZONTAL POLAR PATTERNS
(Relative Voltage)



GAIN CURVES



Can be stacked for additional gain.

MEMBER

CHANNEL MASTER CORP. ELLENVILLE, N. Y.

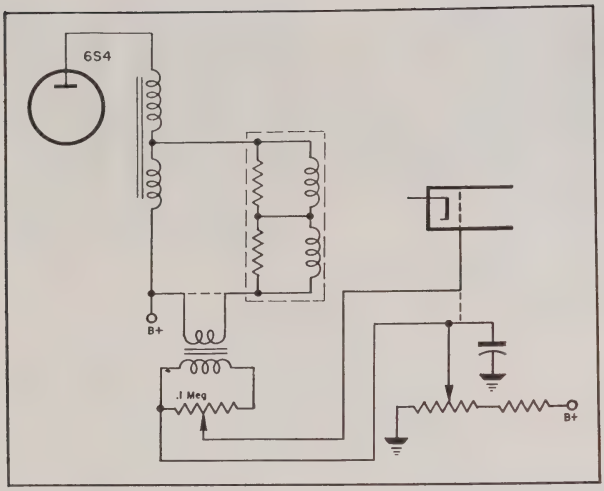


Fig. 3. Circuit in Admiral TV chassis (*21* and *22* series) detailing changes required to provide for retrace line elimination. Dotted lines show original wiring.

factory mainly due to tolerances used in manufacturing and aging of tubes. Admiral service department has found that the following method (for 21 and *22* series chassis) provides an adjustable control so that a pulse of correct amplitude may be applied to the picture tube:

(*1*) A 100,000-ohm potentiometer should be connected across the primary winding of a speaker transformer.

(*2*) The voice coil winding of the speaker transformer should then be connected in series with the vertical deflection yoke, as shown in Fig. 3.

(*3*) The green lead going to pin *2* of the picture tube should be cut and the portion of the lead remaining on pin *2* connected to the center arm of the potentiometer, and the other portion of the green lead connected to an outer terminal of the potentiometer. The potentiometer should be adjusted until the retrace lines are removed; if the retrace lines do not disappear or they become brighter, the green lead should be changed from the outside terminal of the potentiometer to the other.

With the contrast control set at minimum annd the brightness control at maximum the potentiometer should be adjusted to the point where the retrace lines just disappear.

Removal of Popping Sound

When TV receivers are tuned *on* or *off*, popping sounds may be heard. In Sentinel 21-inch sets it may be due to electrostatic voltage build up between the picture tube and the built-in antenna. The lack of outer dag coating on the picture tube creates this condition. In 17-inch models, the trouble may be due to a similar electrostatic voltage build up between the mask and the picture tube.

21-Inch Model Remedies

To remedy, in 21-inch models the built-in antenna should be removed. In 17-inch sets a ground connection should be made between the mask and the chassis.

There are other sources of high voltage popping, the service department of Sentinel notes, but when not traceable to common causes, the foregoing should be checked.

Intermittent TV Chassis Cure

On some Radio Craftsmen RC 100A TV chassis, intermittent conditions have been found in the *hv* section. In these sets when the picture tube normally lights, the 6BQ6GT will appear more blue than usual, and then the plate will turn red. New 6BQ6s, 6U4GTs and 1B3GTs will not cure the trouble. If the ¼-amp fuse to cathode of the 6BQ6 is removed, the tube will light normally, but, of course, the picture tube will not, and if the plug to the deflection coils is removed, the 6BQ6 will light normally. When the set is working properly it was found that this same effect could be brought on (plate of 6BQ6 turning red) by removing the 6AR5 horizontal oscillator tube. Removing any of the following tubes will hardly affect picture results: 6AL5 horizontal sync discriminator; 12AU7 sync separator and sync clipper; 6AH6 horizontal control; 6AL5 vertical sync discriminator, and 6AU6 keyed *agc*. If the 12BH7 vertical oscillator and vertical control, or the 12BH7 vertical output tubes are removed, the plate of the 6BQ6 will be normal, but thin horizontal lines will appear on the picture tube. When this condition obtains, the plate voltage of the 6BQ6 when the set is operating, is 415 *v*, and when the plate is red, it is 225 *v*.

Solution to Problem

According to Radio Craftsmen engineers, if an input signal to the 6BQ6 grid is not supplied from the horizontal oscillator, the 6BQ6 grid will be driven positive instead of the normal −30 *v* (grid voltage). Any components in the horizontal circuit which will disrupt the output of the horizontal oscillator will affect this condition, and it has been found that the component which most likely will cause this difficulty is a shorting of C_{67}. Other components which fail in the horizontal oscillator will also cause this condition, including C_{81} and C_{82}.

Westinghouse Service Notes

Models H-355T5 and H-356T5, Chassis V-2157-5: A possible cause of motorboating on these chassis can be eliminated by a slight rearrangement of wiring. The wire that is connected between pin *6* of the 50C5 and the second *if* transformer should be removed. Lead *7* of the multiple capacitor and resistor assembly (Z_1) from the second *if* transformer should be disconnected, and connected to pin *6* of the 50C5 socket. An insulated wire should be connected between pin *6* of the 50C5 socket and pin *6* of the 12BE6 socket.

Transformer Overheating Cure

Overheating of Horizontal Output Transformer . . . TS-67 TV Chassis: Cases of the horizontal output transformer overheating in Motorola TS-67 TV chassis have been traced to a resonant condition in the horizontal linearity circuit. This condition is, in turn, due to the improper setting of the core in the horizontal linearity coil. For proper adjustment, the fuse should be first replaced temporarily with a milliammeter having a 150-ma scale. The slug should then be adjusted throughout its range. It should

(*Continued on page 76*)

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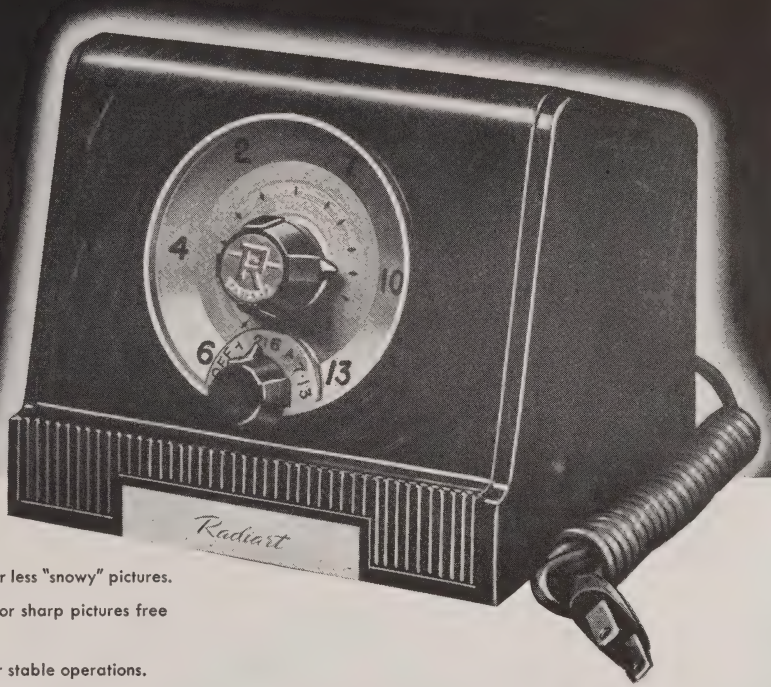
with the Radiart TV Booster



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- ★ **Attractively styled cabinet with mahogany grained polished finish . . . matching the rotor control cabinet . . . together making the TV TWINS . . . the ideal combination for the MOST in TV reception.**

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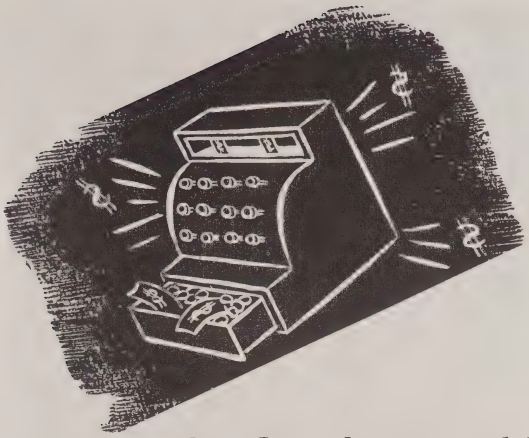


Business Aids . . .

Average Shop Gross Income, and Personnel and Space Requirements

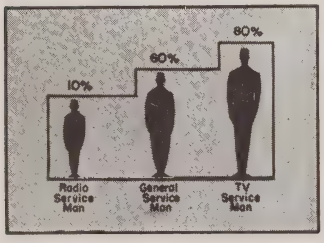


Fig. 1. Percentage of calls in the home made by the radio Service Man, general Service Man and TV Service Man.

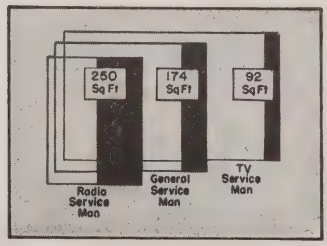
Dear Don Kay:

I plan to enter TV servicing, and would like to know what an average shop might gross, how many persons might be required to furnish a complete service, amount of floor space required and billing bases for service calls.—*M. T.*

Dear M. T.:

According to a survey recently completed by the tube department of General Electric, the average TV Service Man 'grossed $21,000 last year at the rate of $8 per call, and his gross service income

Fig. 2. Service space required by three basic types of Service Men. Less space was found to be required by the TV Service Man because of time spent in home servicing.



[If you have a business-aid problem, send it to ye editor, and every effort will be made to publish a solution in an early edition of SERVICE.*]*

will be up 27 per cent this year. About 5.3 Service Men were found to be necessary in a shop handling 37 calls a week apiece, of which 80 per cent are handled in the set owner's home.

Reviewing the survey at the recent NEDA meeting in Philadelphia, John T. Thompson noted that the average shop was found to cover 1,000 square feet of floor space, including an average of 92 square feet of service space for each Service Man. Business in such a shop, he said, required the services of an accountant to handle bookkeeping and accounting.

The G.E. specialist also revealed that a comparison of returns from television, radio, and general Service Men indicated that while the television Service Man was grossing $21,000 last year, the radio Service Man was grossing $9,000 and the general Service Man, $15,500.

The average billing for radio service calls was noted as $5.50, $7.50 for general service, and $8.00 for TV service.

A graphical analysis of the survey revealing volume of business, service calls in the home, calls per week and service space requirements appears in Figs. 1 to 4.

Sincerely,

DON KAY

SERVICEMAN CONTEST JUDGING

Reviewing the entries of finalists in the G. E. *Bigger Summer Business* contest for Service Men at the recent NEDA convention in Atlantic City: G. A. Bradford, G. E. tube department ad manager; Mort Farr, president of the National Appliance and Radio-TV Dealers' Association; John T. Thompson, manager of G. E. replacement tube sales; and John F. Rider. George Wedemeyer, NEDA president, and Howard Sams, also took part in the judging. The five-man judging panel selected C&W Television Service, Inc., Cambridge, Mass.; Department 84, The Harris Company, San Bernardino, Calif.; and Young's Radio and Television, Chicago, Ill., as the three top entries. Each of the three winners will receive a Dodge truck.

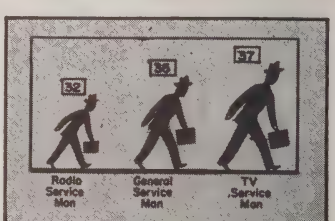


Fig. 3. Calls Service Men make per week.

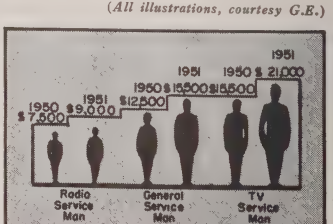


Fig. 4. Volume of service business for the three types of service business for '50 and '51.
(All illustrations, courtesy G.E.)

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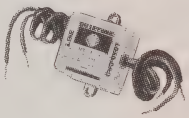
10514 Dupont Avenue • Cleveland 8, Ohio

That interference problem?

...Sure!  there's a C-D filter just for it!

- Feed-thru and Pi filters for mobile, aircraft and marine equipment.
- Ignition and interference filters for use on generators, ammeters, etc.
- Quietone interference filters, for home, industrial and heavy-duty electrical equipment.
- Made by C-D, world's largest producer of interference filters.
- Write for Bulletin 200C today. Department S-122. Cornell-Dubilier Elec. Corp., So. Plainfield, N.J. Your local Classified Phone Directory lists your nearest C-D jobber.

CONSISTENTLY DEPENDABLE
CORNELL-DUBILIER
CAPACITORS
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PLANTS IN SO. PLAINFIELD, N. J. • NEW BEDFORD, WORCESTER AND CAMBRIDGE, MASS. • PROVIDENCE, R. I. • INDIANAPOLIS. IND. • FUQUAY SPRINGS, N. C. • SUBSIDIARY, RADIART CORP., CLEVELAND, O.

TV SET OWNERS
Should Know These Facts!

ASSOCIATED RADIO-TELEVISION SERVICEMEN OF NEW YORK INC.

TO get the most satisfaction from your TV set, you need competent, honest service.

Many articles have appeared telling of the abuses which exist in Television Servicing. *But the public should also be aware of a very effective and powerful force which is striving to correct these abuses*

A group of Servicemen have formed a non-profit organization with a three-fold purpose : (1) *To raise the standards of the Servicing industry* (2) *To insure competent, honest service for the consumer* (3) *To secure a better future for Servicemen.*

"ARTSNY" PUBLIC POLICY COMMENDED BY TRANSVISION

The TRANSVISION Franchised TV SERVICE AGENCIES are proud to associate themselves with "*Artsny*" in their aim to raise the level of servicing, workmanship, and honesty in order to give the consumer the best servicing for every dollar spent on service.

TRANSVISION, like "*ARTSNY*," have the firm belief that only an industry devoted to consumer satisfaction offers a future to those participating in it.

The TRANSVISION Franchised TV SERVICE AGENCIES

Portion of an advertisement which appeared in one of the New York City morning dailies recently announcing the credo of ARTSNY as a basic requirement for entry into Transvision plan.

Associations

ARTSNY

REPRESENTATIVES of component and instrument manufacturers have been delivering a series of lectures at the club rooms of the Associated Radio-Television Servicemen of New York.

At one meeting, Chet Jur, of Merit Coil, discussed the design and applications of coils, transformers, yokes, etc., in TV, and explained how to diagnose and cure troubles in typical chassis where these components are located.

At another session Dave Gnessin of Transvision described the operational characteristics of TV picture tubes and procedures that can be applied to extend the life of the tubes. The meeting also featured a talk by Herbert Suesholtz, general manager of Transvision, who outlined an authorized TV service shop plan that will be widely advertised and promote the advantages to be gained from ARTSNY membership. The ads have begun to appear in morning dailies and will also appear in magazines, soon.

TSA, Michigan

THE TELEVISION SERVICE Association of Michigan have announced that they will publish a consumer's monthly, *TSA News*, which will include basic information on what TV set owners should know if they are considering the purchase of a new set or are in need of service. Copies will be mailed free, when requests are sent to servicing members of TSA.

At the recent Michigan State Fair, over 30,000 saw the TSA booth and received sample copies of *TSA News* Featured at the TSA booth was a closed-circuit TV camera, furnished and operated by the Radio Electronic Television Schools. The camera was hooked up to a pair of 17-inch TV sets, one being in the booth and another several booths away.

Currently 46 shops are members of TSA, and several distributors, reps and a broadcaster are associate members.

RTTG, Miami, Florida

A TEST EQUIPMENT DEMONSTRATION highlighted a recent meeting of the Radio and Television Technician's Guild, Miami, Florida.

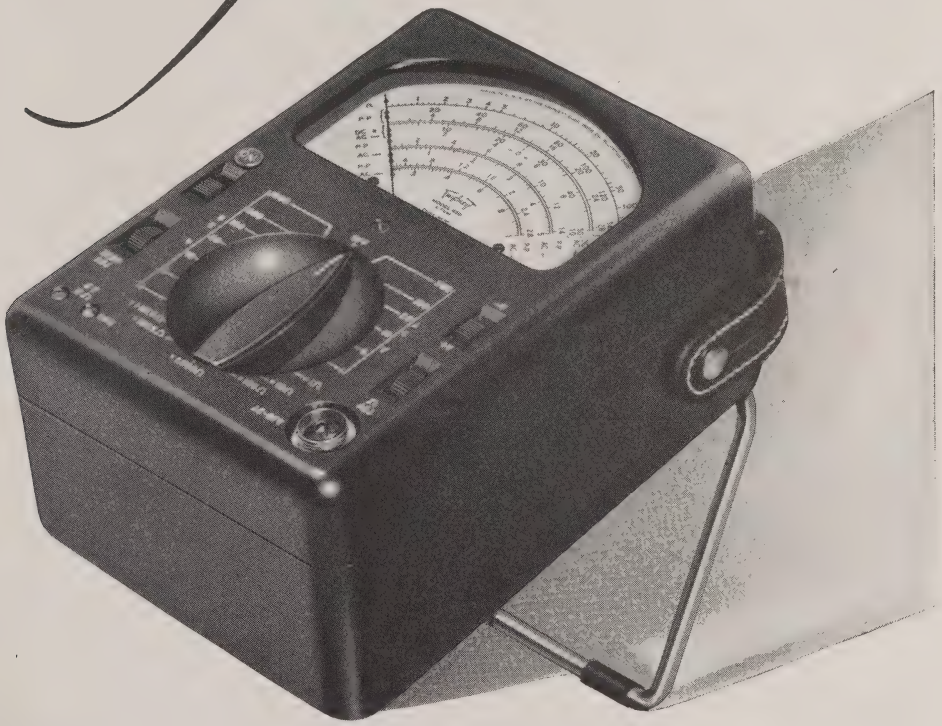
Under the sponsorship of Herman Radio Supply Company, the session was conducted by Dick Rudolph and C. Byron Farmer of General Electric.

TRIPLETT

650 VTVM

There's Nothing finer for

Television



This combination of features explains why

- Complete frequency coverage with one probe, 20 cps to over 110-mc. Insulated and shielded RF tube probe, found usually only with laboratory instruments, is included.
- Peak to Peak ACV and RF with one probe.
- One volt full scale reading on AC & DC.
- One main selector switch, all ranges.
- ACrms—Peak to Peak
- 32 Ranges
- Zero center mark for FM discriminator alignment plus any other galvanometer measurements.
- High input impedance 11 megohms on DC.

Suggested U.S.A. Dealer Net $69.50 • *Prices subject to change without notice.*

TRIPLETT ELECTRICAL INSTRUMENT CO., BLUFFTON, OHIO

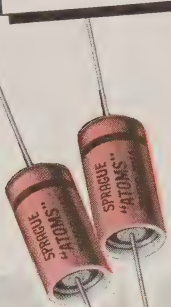
Triplett

TRIPLETT

SERVICEMAN'S DIARY....by Ben Grim
IF YOU CAN'T FIX THIS SET SO I CAN WATCH THE FIGHTS TONIGHT, I'LL TAKE MY BUSINESS TO ANOTHER SHOP! BLAH! BLAH! BLAH! BLAH!
BLAH! BLAH! BLAH!
THE LOUDEST SQUAWKERS ARE
WOTTA RELIEF! I WAS AFRAID DEADBEAT WAS GONNA BORROW THE $10.85 FROM ME!
THE ONLY TIME DEADBEAT SMILES IS WHEN HE'S ASKING FOR CREDIT. THEY CALL HIM "LAUGHING BOY" AT ALL THE STORES!
ALL FIXED NOW! MR. DEADBEAT, THAT'LL BE $10.85 FOR TUBES AND LABOR
$10.85
WELL NOW, HEH. HEH! I SEEM TO HAVE LEFT MY WALLET AT THE OFFICE HOW ABOUT PAYING YOU A WEEK FROM TUESDAY!
THANKS TO C.B. STURDEVANT VENICE, CAL.
TV SERVICE
OFTEN THE POOREST PAY!

You're always right with Sprague's 85°C (185°F) smaller, versatile and dependable

ATOMS



You only need to stock one 'lytic tubular for every application when you buy Sprague Atoms . . . whether it be an auto radio set . . . a home radio-phonograph combination . . . or a television receiver. Sprague Atoms are the smallest dependable electrolytics. They're always right size-wise to fit the most crowded chassis. And they're right temperature-wise to fit the hottest TV receiver!

Write for Catalog C-608 to Sprague Products Company, 61 Marshall St., North Adams, Mass.
(Distributors' Division of Sprague Electric Company)

INSIST ON
ATOM® ELECTROLYTICS
MADE BY
SPRAGUE®
THE WORLD'S LARGEST CAPACITOR MANUFACTURER

TEN YEARS AGO

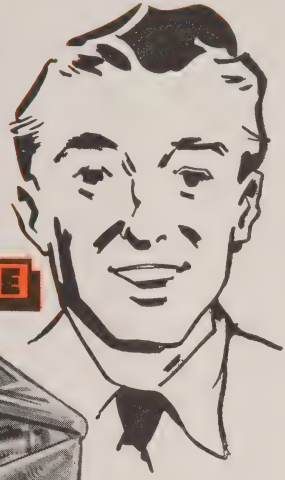
In an article on *The Future of Servicing*, Jerome J. Kahn, president of Standard Transformer Corp., proposed a unified program for proper wartime servicing in the face of depleted materials and manpower. Time devoted in making the service call, Kahn noted, could be saved by having *John Q Public* bring the chassis to the shop, or some collection point, such as the parts jobber, for repair. Such a program, it was said, would expedite servicing, and even provide a basic pool of parts. . . . *Bypass capacitor substitution*, an article by M. E. Heller, in the November '42 issue, analyzed all possible applications of these components, showed how to calculate impedance of capacitors, and detailed what type and range should be employed in various circuits. . . . Antenna circuits, rotating loops and allied coupling systems, served as the bases of receiver circuit analysis in the Ser-Cuits section. Reviewed were the Philco PT-91 to 95, Philco 42-380, code 121, Garod series 100 and series 60, Automatic Radio 147 and 175, Wells Gardner 7D11, Silvertone 7108 and 7158, Airline 14 BR-440A chassis. . . . In the second installment of the series on *Instantaneous Sound-Recorder Wartime Service*, by Alfred Ghirardi, record-cutting components were described, including details on turntable and motor, cutter-feed mechanism and feedscrew operation. Playback facilities and input-level monitoring were also discussed. . . . Featured on the front cover was a circuit of the Westinghouse WR-621K1-2 battery and line-powered portable with a resistance-coupled *rf* stage, isolated filaments and a unique power-switch system. . . . Fred Ellinger, it was reported, had finished 10 full years of selling Aerovox capacitors out of Chicago. . . . J. H. Robinson had been appointed sales manager of National Union . . . Army-Navy *E* Production awards were received by Weston Electrical Instrument Co., Newark, N. J., Sylvania's Emporium plants, Chicago division of Philco and Clarostat. . . . Walter L. Schott Co., Beverly Hills, Calif., was awarded a *Bulls Eye* flag by the Treasury Dept. for 100% employee participation in payroll allotment plan. . . . John G. Porter was placed in charge of all sales promotion activities of the transmitter and electronic tube division of G.E., at Schenectady.

Insist upon

ELECTRONIC HARDWARE IN HANDY RE-USABLE HINGED COVER PLASTIC BOXES

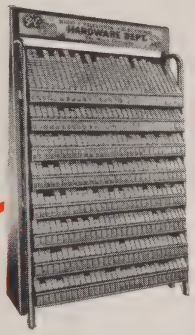
it's the new

G-C 50 LINE



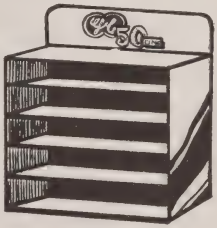
NOW YOU CAN BUY all your radio-TV hardware—240 different items—in sturdy, re-usable *Hinged Cover* plastic boxes. Make your work bench neater and handier. Look for . . . ask for . . . the *Hinged Cover* hardware in the G-C self-service display at your distributor.

LIST PRICE 50c
Subject to
Dealers Discount



BUY WHERE YOU SEE THIS DISTRIBUTOR'S DISPLAY — HE HAS THE COMPLETE STOCK

SPECIAL OFFER TO SERVICE MEN — Handy steel rack for your bench or shop wall... holds 30 G-C Hinged Cover hardware boxes. See your distributor for details.



GC

GENERAL CEMENT MFG. CO.
ROCKFORD, ILLINOIS, U.S.A.

AUDIO installation and service

Phono-Tape-Wire-PA-Amplifiers-Speakers

by KENNETH STEWART

WITH THE CONSTANT increase of custom installations employing high-fidelity chassis, more and more Service Men are being called upon to service these units. Although conventional design techniques are used in the basic approach of these hi-fi units, refinements of an elaborate nature normally distinguish these chassis from standard type equipment.

In the hi-fi system, the amplifier is particularly important, and several effective types of amplifier circuits have been developed to provide wide-range coverage. In Fig. 1 appears one such circuit,[1] with refinements which have been found to result in 20 to 20,000 cps reproduction with less than .1 per cent harmonic distortion at 10 watts. Known as the Williamson circuit, it features a cathode resistance in the KT66 power output, divided into matched 400-ohm resistors which are connected to the cathodes with a removable link. This arrangement has been found not only to simplify *balance* and *bias* adjustment, but also afford accurate results with commonly available volt-ohm meters.

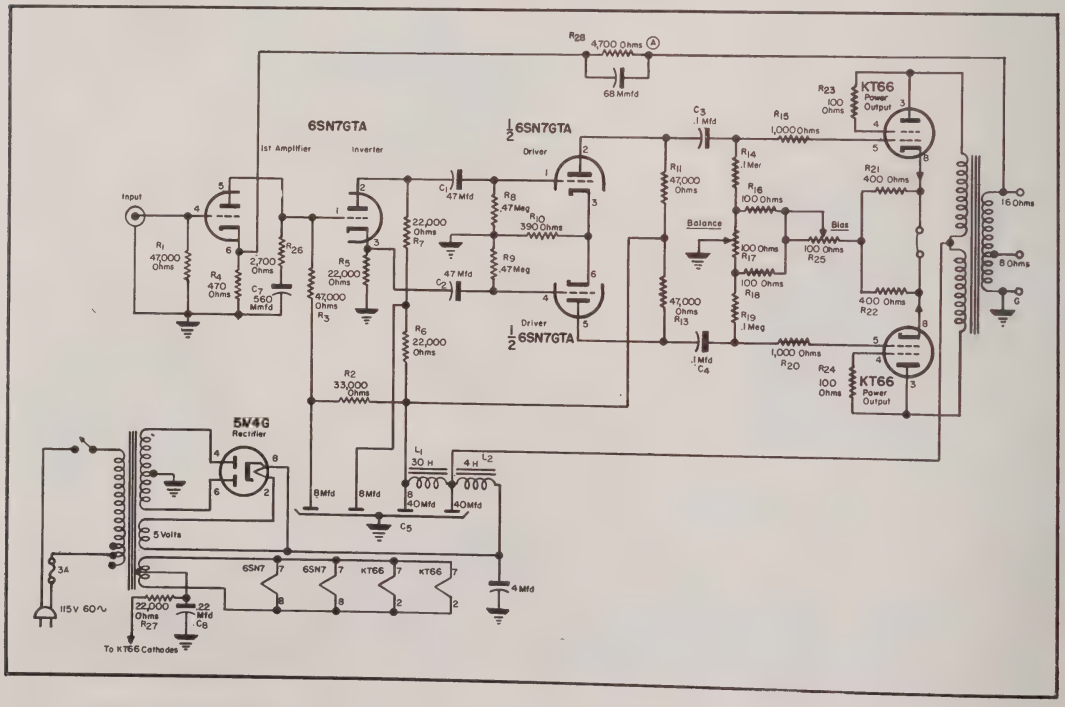
The *balance* and *bias* controls, preset at the factory, need be adjusted only when one or both of the KT66s[2] are replaced. To readjust, the *balance* and *bias* nameplate should be removed and one side of the link on the output cathode terminal board opened. Then a *dc* voltmeter should be connected across the two terminals on this board. The *balance* potentiometer should now be adjusted for a zero reading on the voltmeter, using lowest voltmeter scale.

Now the lead of the *dc* voltmeter must be connected to either terminal on the cathode link board and the lead to the junction of the two 400-ohm, 10-w resistors (R_{21} and R_{22}). The *bias* potentiometer must now be ad-

*Based on notes prepared by *Bernard A. Menarik*, formerly application engineer, *Radio Craftsmen*.

[1]Radio Craftsmen C500.

Fig. 1. Circuit of Radio Craftsmen C500 amplifier featuring the Williamson system. The value of the resistor at *A* in the 6SN7GTA cathode circuit was selected to provide for 20-db feedback.



Servicing Williamson Amplifier...Record Changer Turntable Removal Hints . . . Speaker Enclosure Design . . . Compound Diffraction Projectors . . . Two-Speed Tape Recorders

justed until the meter reads 25 volts. The voltage to the other cathode terminal should also now read 25 volts; if not, the *balance* operation should be repeated.

It should be possible to vary the 25-volt bias adjustment from 22 to 28 volts (approximately), 25 volts being somewhere near the mid-position of the bias potentiometer. Should it be found that the 25-volt adjustment appears at either extreme end of the bias potentiometer, it is probably due to a low 450 *v B* supply. This in turn may be traced to a low emission 5V4G rectifier or the line voltage may be abnormal. The tapped primary should be set to accommodate the low or high voltage condition.

Although the KT66s (beam tetrode power output tubes) are connected as push-pull triodes and matched to 10,000 ohms plate-to-plate for low distortion class *A* operation, apparent normal operation will seem to take place, where one KT66 is completely inoperative. However, an excellent clue of this condition will appear in a comment from the user of the hi-fi system that there seems to be something lacking in the reproduction. Actually a small loss in bass has taken place, causing the defect.

There are many installations where the amplifier is in a remote or hidden enclosure, thereby obscuring the non-operative tube. When replacing a defective KT66 tube, the *balance* and *bias* adjustments must be rechecked.

The very low output impedance of the amplifier results in a large damping factor, which has been found to reduce transient distortion. This effect will be noted by observing the results when the amplifier is used on a standard 5-inch speaker.

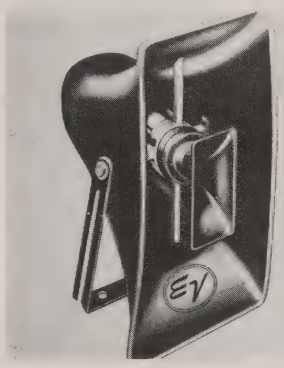
Despite the flat gain versus frequency characteristic of the amplifier, loss of bass might be observed with the use of some loudspeaker systems, due to the damping action at the amplifier output. In spite of the obvious merits of good speaker damping, occa-

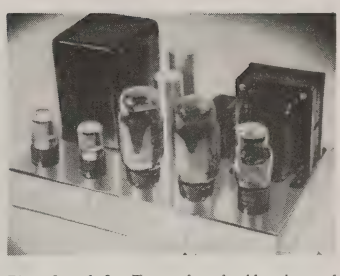
(*Continued on page 60*)

[2]Since all KT66s are factory prechecked for matched plate impedances before use, it has been found convenient to divide these tubes into various categories and mark each tube accordingly on the tube base near pin *6*, in white ink. The exact matched replacement tube as originally selected for the particular chassis can be ordered by indicating the white number marked on the tube base.

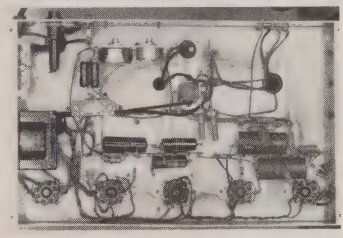
Tape recorder with an integrally built-in dual speed capstan which converts recording speed from standard 7½" to 3¾" per second producing a minimum recording time of two hours. Unit also features a plug-in type dual track recording head, which can be replaced with single-track recording head for professional applications requiring editing and splicing. An automatically engaged pressure roller is said to keep tape in close contact with capstan preventing slippage and minimizing wow and flutter. A *Ful-Vue* volume peak indicator window is mounted directly underneath the volume and tone control knobs. Incorporates such features as standard telephone jacks, compensating switch which equalizes the amplifier for both 3¾" and 7½" speeds, 6" *pm* speaker, 5-tube amplifier, safety lock to prevent accidental erasure, separate input and output sockets for recording and playback. Can be used to record directly from a radio tuner or speaker. Frequency response is claimed to be ±3 db, 70-8000 cps at 7½" in/sec and ±3 db, 70-4000 cps at 3¾" in/sec. (*Model 230; Eicor, Inc., 1501 West Congress St., Chicago 7, Ill.*)

Compound diffraction projector, which utilizes two coaxially mounted diffraction horns working from both sides of a single diaphragm. Each projector is said to be designed for optimum air loading and reproduction within its own range, to provide peak-free response ± 5 db to 11,000 cps. Low end response is augmented by 100-cps horn taper. Polar distribution pattern is claimed to exceed 120° at all frequencies up to 10,000 cps. Edgewise wound voice coil assembly uses phenolic impregnated *Fiberglas* diaphragm. Drain holes said to permit subsequent operation after complete water immersion. Loudspeaker system is rated at 25 watts. Impedance is 16 ohms. Can be installed horizontally, or vertically for augmented disperson. Dimensions: 10½" wide at mouth, 20½" high at mouth, 20" deep overall. (*Model 848 CPD; Electro-Voice, Inc., Buchanan, Michigan.*)



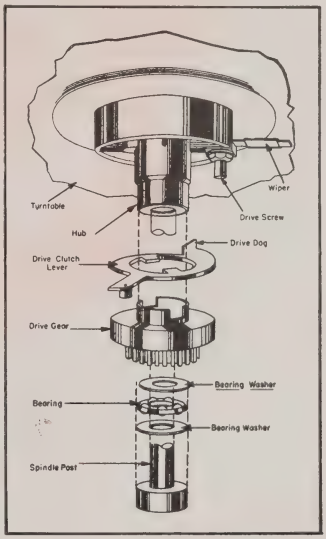


Figs. 2 and 3. Top and underside views of Radio Craftsmen amplifier.



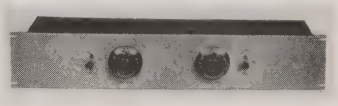
(Below)

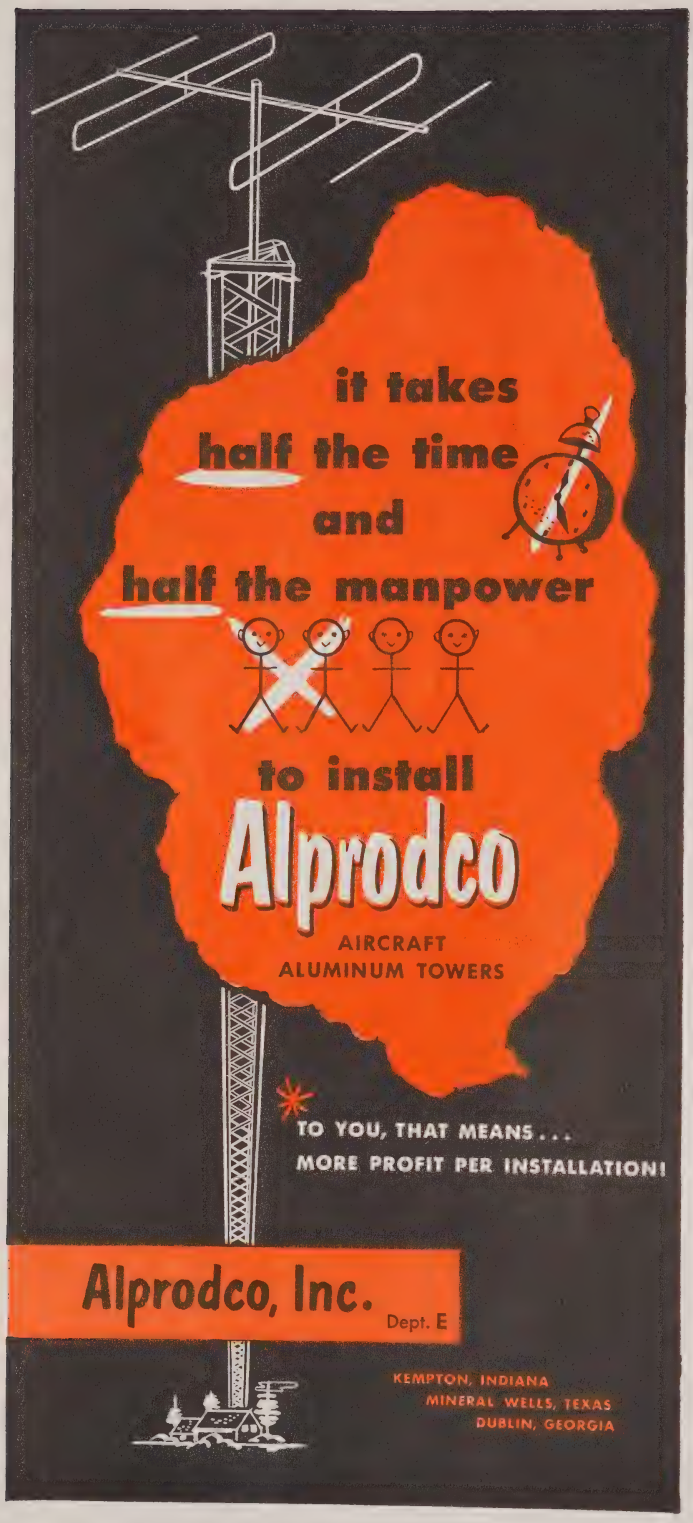
Fig. 4. Exploded view of changer mechanism in Motorola RC models, illustrating location of bearing washers, which must be positioned properly to avoid operational problems, such as wow, rejection difficulties, etc. See pages 60, 61, and 62 for detailed explanation.



(Below)

Program equalizer designed to provide corrections for frequency response in audio equipment, sound pickup and transmission lines. Operation of controls is said to allow over 395 curve combinations, and provide for independent adjustment of high and low frequencies in 2 db-steps. Input level is —70 dbm, minimum and +20 dbm, maximum. (*Type 4031-B; Cinema Engineering Co., Burbank, Calif.*)





Audio

(*Continued from page* 59)

sionally speaker systems have been designed to make use of less electrical damping action to hold up their bass response. Since a well damped speaker system is always preferable, the speaker response should be compensated elsewhere in the system.

This recompensation may take one of two forms. The bass tone control, which in many installations is located in the AM-FM tuner section, may be advanced slightly to supply a higher level of the low frequency notes. This extra manipulation will be accompanied by a cleaner presentation of sound from the well damped speaker.

Another and increasingly popular approach to recompensation is the trend to use a folded-horn enclosure which utilizes the corner of the room as part of the exponential folded corner horn.

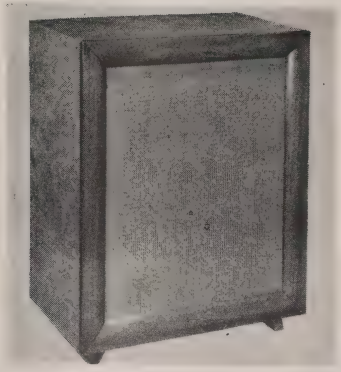
Record Changer Turntable Removals

When the turntables of Motorola record changers RC-36A, RC-36C, RC-37 and RC-40 must be removed for inspection or service, several precautions should be observed.

Normally, a retainer clip[3] which fits around the record spindle, holds the turntable in place and prevents its accidental removal. This clip, if miss-

[3]Motorola part No. 42K692053.

Tape recorder which features a keyboard control; five piano-key type pushbuttons for selection of operating functions, including *fast forward, playback, stop, record,* and *fast reverse.* Two speeds and dual-track recording head provide four recording times. At slow speed of 3.75" per second, a 7" (1200') reel records continuously for one to two hours by recording on the second half of the tape width. At the fast speed of 7.5" per second, these recording times are one-half hour continuously and one hour overall. Frequency response is said to be substantially flat from 70-8500 cps at 7.5" speed, and 90-6000 cps at the 3.75" speed. Recording may be made from microphone supplied, or direct from radio, FM tuner, or phono. Playback is through built-in amplifier and 5x7" oval speaker. (*Knight automatic control tape recorder, model 96-485; Allied Radio Corp., 833 West Jackson Blvd., Chicago 7, Ill.*)



Bass reflex cabinet with mahogany front and matching leatherette top and sides. Single grille cloth covers the entire front panel, concealing the two separate sound openings. Has a 7564-cubic inch capacity for 15-inch speaker. Provided with a ½" celufoam padding. Overall size: 23⅞" w, 30" h, 14⅞" deep. (*Model DBR-15; Argos Products Co., 310 Main Street, Genoa, Ill.*)

ing, should be installed on all changers serviced.

A very important washer is located directly beneath the turntable on the spindle, and, because of the lubricant, it might adhere to the turntable when the turntable is removed. It might then fall to the floor without being noticed and become lost. This washer is shown in Fig. 4 (p. 59) as the top one of the two bearing washers.

If the turntable is replaced without the bearing washer, it will set too low, and any of five troubles may occur:

(*1*) The turntable speed may be slow or uneven, producing wows. (*2*) The wiper will set too low, and the

(*Continued on page 62*)

Unidirectional dynamic microphone featuring a multi-impedance transformer, impedance selector switch, and sintered metal method of acoustic phase shifting, which is claimed to provide a front-to-back pickup differential of approximately 15 db. Internal dynamic element is floated in rubber. Impedance selector switch provides operating impedance of 50, 200, 500 and high *Z*. Output level of mike is said to be —54 db (1 volt per microbar) and range is claimed to be 40 to 10,000 cps. (*Model DR-11; Astatic.*)

FOR THE FIRST TIME Anywhere!

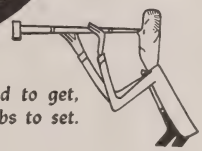
A BROAD BAND, 3 TUBE, 3 STAGE, FULLY AUTOMATIC BOOSTER WITH ALL-CHANNEL GAIN IN EXCESS OF 16 db.

and only $39.50 LIST

THE NEW B-T BOOSTER

MODEL HA-3 Fully Automatic

DESIGNED FOR BETTER TELEVISION



What John wanted most and found hard to get,
Was a booster what boosted, with no knobs to set.

"Knobs," he complained, "makes tuning more tough,"
And, "Lord knows", he cried, "My set has enough."

"And who needs more boxes to clutter the house?
There's enough work around for me and my spouse."

"You'd laugh if I cranked my car like we useter,
So why have old-fashioned knobs on a booster?"

But, John had a Tech-man who knew his TV
Who showed John the booster made by B-T.

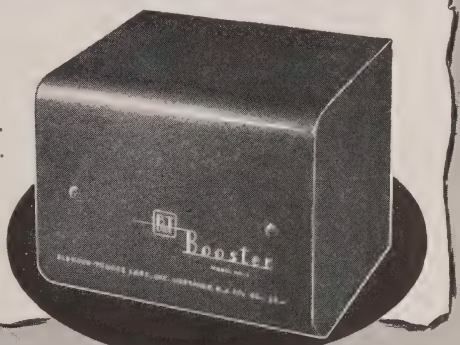
At last, John is happy, and more so to learn
That the booster is hidden and no knobs to turn.

NO knobs to set.

NO channel tuning.

NO band-switching.

Lower noise factor.
Attractive hammertone steel cabinet.

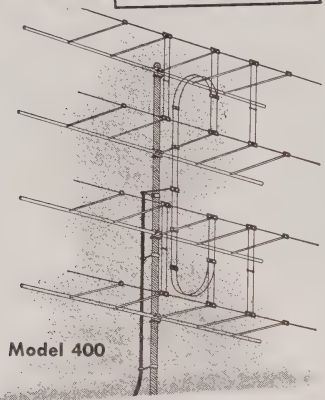


B-T LABS

BLONDER-TONGUE LABORATORIES, INC.

WESTFIELD, NEW JERSEY

PATENTED
FINCO
20 in 1
the Sensational
TV ANTENNA
THAT WINS
FRIENDS
AND MAKES
MORE SATISFIED
CUSTOMERS!



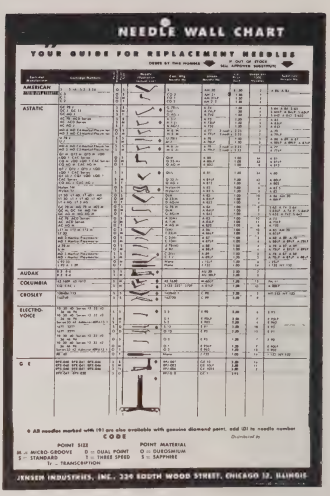
Model 400

Features . . .
- Clear pictures up to 120 miles and more from station!
- 12 driven elements on high band!
- 8 driven elements on low band!
- High gain—low noise!
- One antenna—one transmission line!
- Total weight only 8 lbs.!

..Preassembled for easy-fast-simple installation!

Here's the key to more and more installations in fringe areas—the new FINCO 20-in-1 Antenna that provides the best reception over 100 miles from stations. Your customers will say "you are a magician" when they compare FINCO reception with any other antenna. You can build yourself an outstanding reputation by recommending the FINCO 20-in-1 because every satisfied customer tells and sells another. Get your share of the profitable sales that are just waiting to be made in areas where good reception has never been available before by getting acquainted with the FINCO 20-in-1 today. See your Jobber.

The Finney Company
4612 ST. CLAIR
CLEVELAND 3, OHIO



Portion of replacement needle wall chart with 78 replacement needles silhouetted, each with a Jensen Durosmium or sapphire equivalent. Requirements of 16 leading cartridge manufacturers are represented. Chart also lists all the diamond needles currently available in line. Also shown on chart is a *best seller* list which indicates the relative turnover of each needle, disclosing in effect, needles which sell best. Another feature in the wall chart is a column devoted to authorized needle substitutions. Copies of the wall chart, which measures 8" x 22", may be obtained from Jensen distributors or by writing direct to Jensen Industries, Inc., 329 S. Wood Street, Chicago 12, Ill.

Audio

(*Continued from page* 61)

changer may not reject. (*3*) The drive screw will set too low, causing a click against the drive dog on each revolution; or the drive clutch lever may be moved to the top of the incline on the trip lever, causing the changer to jam and stop. (*4*) The under side of the turntable may rub on the idler wheel, producing a grinding noise. (*5*) The rim of the turntable may rub on the restoring lever during a change cycle.

The Service Man should always make sure that the bearing washer is not missing.

If a bearing washer does become lost, the replacement should not be one of soft iron, but a hardened steel washer.[4]

If, upon removal of a washer, a groove worn by the ball bearings is noticed, both washers should be replaced. Early washers were polished chrome on one side and were soft; replacement should be with the later, dull-finished type.

Groove in Rubber Wiper

The wearing of a groove in the rubber wiper under the turntable may be caused by lack of, or improper, lubrication. The correct lubricant to use is Dow-Corning DC-33 silicone lubricant,[5] and not a petroleum-type lubricant, for it will soften the rubber.

Trip Adjustment

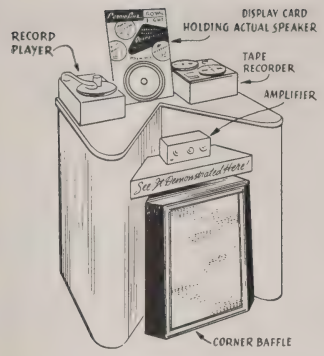
If the changer does not trip after playing a record, or trips before a record has completed its play, minor adjustments can be made while the changer is still in the cabinet. Four steps are involved in this procedure: (*1*) The turntable should be removed. (*2*) If the changer trips too soon at 78 rpm, the wiper bracket should be bent downward slightly, toward the trip rod. (*3*) If the changer does not reject at 33 then the wiper bracket should be bent upward slightly, away from the trip rod. (*4*) If the trip mechanism still does not function properly, it will be necessary to remove the changer from the cabinet.

Admiral Changer Service Notes

Reports have been received citing difficulty in removing the turntable

[4]Motorola part No. 4A691286.

[5]Motorola part No. 11M488020.

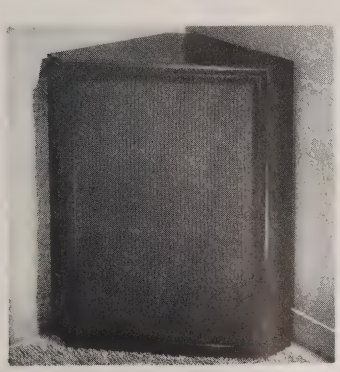


Corner display unit designed to supply proper corner position for demonstrating reproduction available from Permoflux CH-8M corner horn speaker enclosure. Unit measures 42½" wide, 48" high, and projects out from the wall 20½". Construction is of pre-formed masonite and plywood with rib-type bracing to prevent vibration. Horizontal ribs in the rear, provide shelf space for preamplifier units.

from Admiral RC600 record changers since the plastic escutcheon gets damaged if the turntable is pried off with a screwdriver. This problem can be overcome by first removing the changer from its cabinet or compartment whenever it becomes necessary to remove the turntable. The changer must be out of cycle, since the turntable cannot be removed without damaging the mechanism if the cycle mechanism is engaged. The retainer clip at the top of turntable should be removed by pulling it sideways with small screwdriver. Then the changer should be placed on its front edge and tilted out enough so that the turntable will loosen on the centerpost as you rotate it by hand. It should come away from changer pan without falling completely off. If necessary, the motor

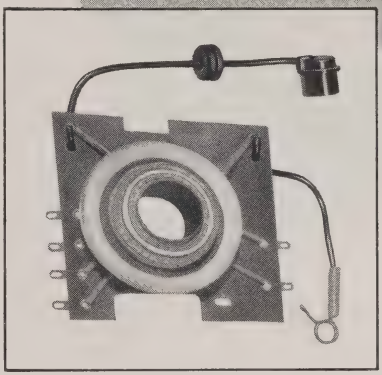
(*Continued on page* 85)

Dual corner horn for two 8" speakers or one 12" speaker. Multiple arrangement of 8" speakers, in parallel, can be employed. Cabinet is 31½" h, 25½" w, and 14" deep. (*Model CH-16M (mahogany) and CH-16B (avodire blond)*; *Permoflux Corp.*)



now 2 specific type FLYBACKS by HALLDORSON service

115 DIFFERENT ADMIRAL TV MODELS



HALLDORSON FB405 and FB406 Horizontal Sweep and H. V. Flyback Coil Assemblies

NEW!!!!

ECONOMY—*With Halldorson FB405 and FB406 Flybacks you utilize costly Ferrite pieces and mounting brackets of Admiral part being replaced.*

CONVENIENCE—*Both units are completely wired to terminal boards with exact length plate leads and clips attached. New H. V. filament wires and easy assembly instructions supplied.*

Think of it! Two parts that are not makeshift arrangements but *specific replacements* for 115 popular TV models made during the last two years by Admiral. You get them as complete coil assembly replacements ready for quick installation. Keep a few FB405's and FB406's on hand for quick service and extra profits!

FB405 and FB406 are now available at your Distributor. Ask also for literature describing hundreds of other Halldorson TV and Electronic components for making your work easier, quicker, and more profitable. See your Distributor . . . today!

HALLDORSON TRANSFORMER COMPANY
4500 N. Ravenswood Ave. • Chicago 40, Illinois
Write Dept. S-11

HALLDORSON

QUALITY *Transformers* SINCE 1913

EXPORT: Intex Co., Inc., 136 Liberty St., New York 6, N.Y. Cable Address: Intexcom, N.Y.

teamed together for

Better TV Picture Quality

AMPHENOL
TUBULAR
TWIN-LEAD

This combination of the famous Amphenol Inline Antenna and the extremely low-loss Amphenol Tubular Twin-Lead permits *any* TV set to present the best picture it possibly can.

The Amphenol Inline is the superior all-channel antenna. The Inline has uniform gain over the entire range of VHF channels—less variation than the 3 decibel change which determines "fuzziness." Its strong forward reception lobe practically eliminates any pick-up of unwanted secondary or reflected signals.

The Amphenol Tubular Twin-Lead provides very low-loss and constant impedance. The tubular construction minimizes the effect of moisture and dirt deposits on the concentrated field of energy and ends weather interference. Because of these characteristics, Amphenol Tubular Twin-Lead has been recommended by leading TV manufacturers and authorities for any installation where UHF is, or will be, available.

Nominal Impedance	300 ohms
Velocity of Propagation	84%
Attenuation db/100 feet	30 mc — .63
	60 mc — .93
	100 mc — 1.25
	200 mc — 1.82
	400 mc — 2.7
	500 mc — 3.0
	700 mc — 3.6
	900 mc — 4.2

This illustration clearly shows that the concentrated field of energy between the two conductors, which are 7 strands of #28 copper weld wire, is contained by the tubular construction. This important field of energy is unaffected by any exterior conditions.

AMERICAN PHENOLIC CORPORATION
1830 SOUTH 54TH AVENUE • CHICAGO 50, ILLINOIS

AMPHENOL

FRINGE-AREA Servicing

by DONALD PHILLIPS

Part III . . . Diagnosing and Solving Problems in AVC Networks...Fringe-Zone Alignment Techniques

THE AVC NETWORK in receivers must be probed thoroughly when troubleshooting. The *avc* voltages throughout the whole network must be checked carefully. Any deviation from normal should be investigated. Recently, a small portable was being tested. All voltages were apparently normal, but there was very little *avc* on the converter, a 1R5. A very detailed investigation finally revealed a high-resistance leak between windings of the oscillator coil, which was allowing the oscillator plate voltage to go through into the *avc*, by way of a 10-megohm resistor, connected from the oscillator grid return back to the *avc* bus. Due to the tremendously high resistance in the whole leakage path, just enough positive voltage was coming through to remove effectively all the *avc*, thus cutting down the sensitivity almost to zero. Incidentally, the oscillator winding in question, a tickler of only a few turns, was removed, the coil coated with *Q-dope* (a liquid polystyrene), dried, and a new tickler wound on by hand.

Resistor Checks

The very small *matchstick* resistors used in some sets can be troublesome, too. The 1 and 3.3-megohm units seem to be the cause of most problems. They increase in value or open entirely, and since they are quite popular as screen dropping resistors and plate load resistors for audio stages etc., they can cause a decided drop in sensitivity. Bias, surge and filter resistors have also been found off their ratings. All resistors in a suspected stage should be checked carefully, using a reliable ohmmeter, and all that show deviation of more than a nominal 10% should be replaced. There are some circuits where the normal tolerance will exceed 10% but it has been found that deviations over this amount or change generally indicate that the unit is on its way out and replacement is wise.

Alignment

Having checked all components, alignment is the next item to consider. In the *fringe areas* absolutely correct alignment is often the only way of insuring performance. And the smaller the set the more critical the alignment. Unfortunately, the alignment adjustments are conspicuous by their absence in far too many cases; the ones remaining must be adjusted to their absolute peak, for the best performance.

The 'scope is an essential tool for this kind of work. With an FM generator and a 'scope, *if*'s and *rf*'s of the smaller sets can be brought to an absolute peak, and the selectivity improved, too.

In summation, it can be said that only the best and most careful work will produce any results at all in fringe areas. work. It's a paying business, even if it is a little tiresome at times.

*Based on notes prepared by Jack Darr.

NEWS

SPIRLING TO EXPAND

Plans for moving manufacturing facilities from 62 Grand St., New York, to a new plant on Henrietta St. at Duffy Ave., Oyster Bay, L. I., N. Y., have been announced by Spirling Products Co., Inc. Building will be on a two-acre lot of ground.

* * *

JENKINS BECOMES NEDA PREXY

W. D. Jenkins, Radio Supply Co., Richmond, Va., has been elected president of the National Electronic Distributors Association, 221 N. LaSalle St., Chicago, Ill.

Other officers for '52-'53 include: *Dahl W. Mack,* Scranton Radio and Television Supply Co., Scranton, Pa., first vice president; *Gerald E. Murphy,* Electronic Supply Corp., Battle Creek, Mich., second vice president; *Max I. Epstein,* Federated Purchaser, New York, N. Y., treassurer, and *J. Howard Klein,* All-State Distributing Co., Dallas, Tex., secretary.

Aaron Lippman, Aaron Lippman and Co., Newark, N. J. has been reelected as chairman of the board.

* * *

R. E. BLASH ELECTED WEBSTER-CHICAGO BOARD CHAIRMAN

R. F. Blash, president and chief executive of Webster-Chicago Corp. through 38 years since he founded the business in 1914, has been elected chairman of the board of the company. *Donald MacGregor,* vice president in charge of manufacture for Zenith Radio Corp., has been elected president, as well as general manager and a director.

* * *

ROLA APPOINTS ADAMS ASSISTANT SALES MANAGER

John H. Adams has been appointed assistant sales manager of The Rola Co., Division of The Muter Co., 2530 Superior Ave., Cleveland 14, Ohio.

Adams joined Rola six years ago. He succeeds *Elmer F. Steffens* who has resigned after ten years.

John H. Adams

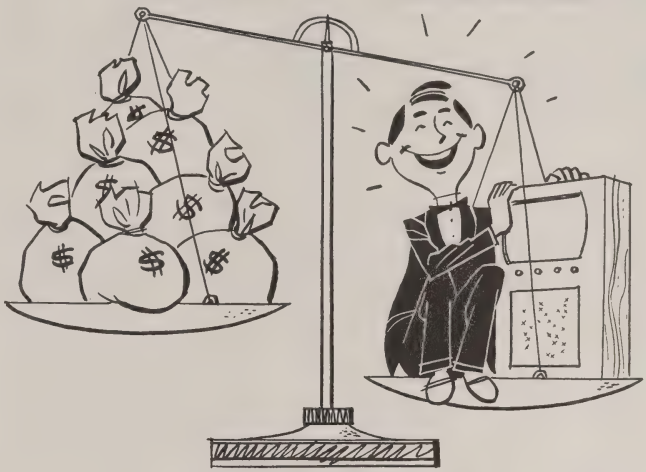
E. P. Robinson

ESPEY APPOINTS ROBINSON PLANT MANAGER

Edward Porter Robinson has become plant manager of the Espey Manufacturing Co., Inc. Robinson joined the company in '47 as project engineer.

[Additional news on page 66]

Your most valuable business asset is a *SATISFIED CUSTOMER!*



insure customer good will with *DEPENDABLE* OHMITE *RESISTANCE UNITS*

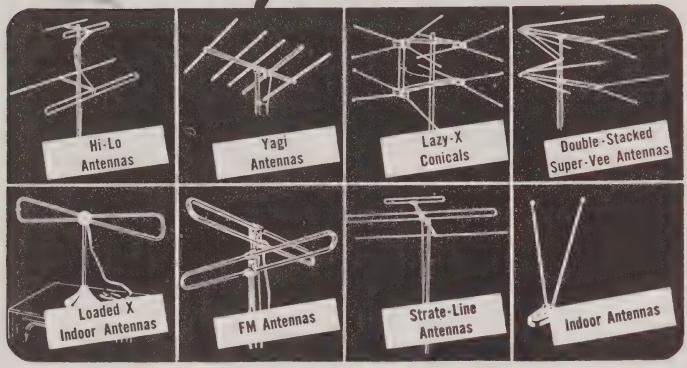
Don't endanger your business reputation by using "just-as-good" replacement parts. Protect customer good will with OHMITE resistance units—known the world over for *dependability.*

Servicemen, amateurs, and engineers everywhere agree that these quality components provide *extra* reliability and long life. Insist on OHMITE resistance units... it's good business!

OHMITE MANUFACTURING COMPANY, 4879 Flournoy St., Chicago 44, Ill.

You'll Always Find What You Need In The...

C-D Skyhawk TV ANTENNA LINE



and you'll find excellence in performance and quality, too!

When you, as a serviceman intent on really serving his customers, choose CORNELL-DUBILIER SKYHAWK TV ANTENNAS, you save time, trouble and money. These are facts. C-D makes an antenna for every requirement and these SKYHAWK antennas have a reputation for top quality and excellent performance—which adds up to customer satisfaction. Why hesitate? — Choose CORNELL-DUBILIER SKYHAWK TV ANTENNAS.

CONSISTENTLY DEPENDABLE

CORNELL-DUBILIER

SOUTH PLAINFIELD, NEW JERSEY

CORNELL-DUBILIER ELECTRIC CORP.

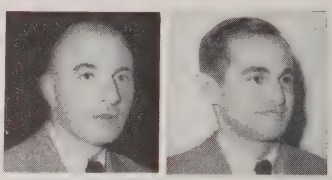
SUBSIDIARY OF CORNELL-DUBILIER ELECTRIC CORPORATION — RADIART

• CAPACITORS • ANTENNAS
• ROTATORS • VIBRATORS • CONVERTERS

LESLIE APPOINTED JFD ASSISTANT SALES MANAGER

Mort Leslie, has been appointed assistant sales manager of the JFD Manufacturing Co. Inc., 6101 16th Avenue, Brooklyn 4, New York.

Abraham Hyman, formerly supervisory electronic engineer for the CAA in New York, has joined the company as an electronic consultant. In that capacity, Hyman will work on antennas and electronic products.



Mort Leslie A. Hyman

* * *

CLAROSTAT'S JACOB MUCHER DEAD

Jacob J Mucher, one of the three brothers responsible for the founding and building up of Clarostat Manufacturing Co., Inc., Dover, N H., died recently.

For twenty-five years Jake Mucher served as treasurer and chief tool designer of Clarostat. He designed the first industrial hydraulic lift; a three-wheeled automobile in 1918; and a refrigerator compressor unit which is now employed by a leading refrigerator manufacturer.

* * *

JACK SIEGRIST NOW MOTOROLA AD MANAGER

Jack Siegrist has been appointed national advertising manager of Motorola, Inc.

Siegrist was formerly advertising and sales promotion manager of Admiral, New York. Prior to that he was sales promotion manager of Peirce Phelps, a Philadelphia appliance distributor

* * *

CHAMPIGNY WINS G.E. PROMOTION

A. L. Champigny has been appointed supervisor of replacement sales promotion for the G.E. tube department. In his new position, Champigny will direct the promotion of tube sales through electronic tube distributors.

* * *

BENDIX APPOINTS LEDERER DISTRICT MANAGER

Walter Lederer, formerly advertising manager for Bendix Television and Radio, has been named district manager of Bendix sales district 3. Lederer will handle factory-distributor-dealer relations in Maryland, Pennsylvania, Delaware, Virginia, West Virginia and the District of Columbia

* * *

ALEXANDERSON JOINS RCA AS CONSULTANT

Dr. E. F. W. Alexanderson has joined RCA as a consultant. Dr. Alexanderson returns to the corporation which he served as chief engineer from '20 to '24.

ALLEN B. DUMONT REELECTED PREXY

At a meetitng of common stockholders of Allen B. Du Mont Laboratories, Inc., *Dr. Allen B. Du Mont* was reelected president; *Stanley F. Patton,* vice president; *Paul Raibourn,* treasurer; *Bernard Goodwin,* secretary; and *Irving Singer,* assistant treasurer.

Elected as directors by holders of class A stock were: *Dr. Allen B. Du Mont, Satnley F. Patten, Dr. Thomas T. Goldsmith, Jr., Percy M. Stewart,* and *Bruce T. Du Mont.*

Elected as directors by holders of class B stock were *Edwin Weisl, Barney Balaban* and *Paul Railbourn.*

OLDEST TACO ANTENNA CONTEST

A contest, in which a Service Man who locates the oldest operating Taco antenna will receive $100 as a reward, and the customer who owns the antenna will receive a new Taco installation absolutely free of charge, has been announced by the Technical Appliance Corp., Sherburne, N. Y.

Complete details of the contest are available at distributors. Contest will close early in '53 so that the winner can receive his reward prior to March 15th. Photo of the winning entry and verification of the installation date will be checked by Taco reps.

RCA APPOINTS TONEY CONSUMER DISTRIBUTION DIRECTOR

James M. Toney has been appointed director of distribution for the RCA Consumer Products Department, Camden, N. J.

Toney was formerly director of public relations for the division.

Julius Haber has been appointed director of public relations for the division, succeeding Toney.

* * *

PINCUS NAMED MOTOROLA-NEW YORK PREXY

Edward L. Pincus has been elected president of Motorola-New York, Inc. Pincus, now president of Motorola-Philadelphia Co., will also continue to head that factory branch as well as the New York factory branch.

Allen Williams, vice president in charge of operations of Motorola-New York, Inc, will be transferred to Motorola's headquarters in Chicago, where he will be the assistant sales manager of the parent company.

* * *

DR. JOHN RUZE APPOINTED GABRIEL RESEARCH DIRECTOR

Dr. John Ruze has been appointed director of research of the Gabriel Laboratories' Division of The Gabriel Co., 135 Crescent Rd., Needham Heights, Mass.

Dr. Ruze was formerly with the Air Force Cambridge Research Laboratories, where he was assistant chief of the antenna laboratory. During the war he headed the antenna design section at the Signal Corps Engineering Labs.

Dr. John Ruze

M. Reiner, RCP prexy

* * *

RCP MOVES PLANT TO EASTON, PA.

Test equipment production of RCP has been moved to a plant at Easton, Penna. The engineering, sales and purchasing departments and the general offices will remain in New York.

Walter Jonas, production manager, will direct operations at both New York and Easton plants. Burt Levy has been appointed sales manager of the jobber and industrial division.

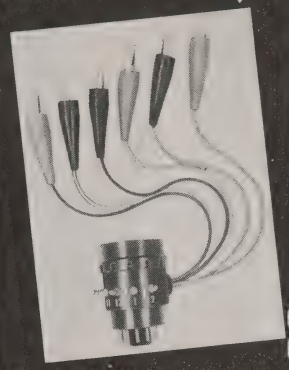
* * *

ITI ADOPTS ONE-YEAR BOOSTER WARRANTY

The adoption of a one-year parts and alignment arranty on all *autoboosters* and field strength meters shipped after October 1, has been announced by Industrial Television, Inc., 369 Lexington Ave., Clifton, N. J.

Under the plan, boosters will be returned to the factory for parts replacement or realignment. A nominal handling charge will be the entire cost.

Terrific *Money-Makers* for Servicemen-



EBCO

DYNAMIC ANALYZER for CR Tubes

Converts your VTVM into the finest CR Tube TESTER that money can buy.

It's the *ONLY* instrument that performs all the necessary dynamic tests . . . Easily attached to your Vacuum Tube Voltmeter, it enables you to make the following ***dynamic tests:*** (1) Check all socket voltages of a TV Set under actual operating conditions . . . (2) *Check emission* of the tube, and get ***related emission*** reading . . . (3) Check Picture Tube for *open elements, shorted elements,* and *leakage.*

A SERVICE ENGINEER'S MANUAL INCLUDED in this amazing low price **$7.95** net

EBCO CHECKER-REACTIVATOR for Weak CR Tubes

Best Investment You Can Make: This superb dual-purpose Checker-Reactivator will bring you a profit the first week you have it. ***CHECKS TUBES*** for *shorts, cathode emission, leakage,* etc. A fine dependable tester, plus—***ADDS NEW LIFE*** to weak dim picture tubes. *Renews brightness, contrast,* and *detail.* FULLY GUARANTEED. Model 10 ..... net **$19.95**

EBCO "LIFE EXTENDER" for CR Tubes

Has *Dual Heat Connection* for dim and very dim tubes

Works on all picture tubes, all sizes. Easily installed—just plug in. *Ideal for Servicemen with service contracts; often saves the cost of a new tube.* Has dual heat connection. Low in cost..... List $7.95; **Net, $2.95**

EBCO FIELD STRENGTH METER *with Fringe Area Switch*

Range: 5 to 50,000 microvolts

Improves TV installations - saves time and labor

Get better antenna orientation, better TV set performance, even in fringe areas. Measures field strength from 5 to 50,000 microvolts at the 300 ohm input terminals. Many other great features. **Model 11**.....net **$69**

We are manufacturers of the finest

Custom-Quality PICTURE TUBES

Engineered to the highest standards. All EBCO tubes are new, ***individually checked, registered,*** and ***guaranteed.*** Substantial glass allowance on your used tubes, through your EBCO jobber.

One Year Factory Guarantee

Write for New Low Dealer Net Prices

We are *Manufacturers* and sell only thru *Parts Jobbers*

Inquiries from Representatives Invited

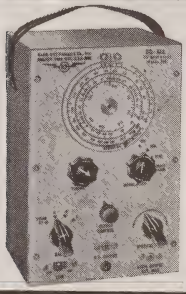
ELECTRONIC BEAM CORP., 923 OLD NEPPERHAN AVE., YONKERS 3, N. Y.

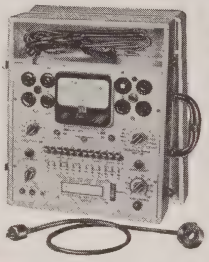
The Sensational New

RCP

'DO-ALL' 3

COMPLETELY SERVICES TELEVISION





TV "Do All" GENERATOR
MODEL 740
IT'S A
- SIGNAL GENERATOR
- AUDIO GENERATOR
- PATTERN GENERATOR
- MARKER GENERATOR

MODEL 740-Complete, Ready to operate . . . $69.50 NET

TV Set & Tube Tester
MODEL 808
- ★ A TUBE TESTER
- ★ A CATHODE RAY TUBE TESTER
- ★ A CATHODE RAY TUBE REACTIVATOR
- ★ A VACUUM TUBE VOLTMETER (AC-DC)
- ★ AN OHMMETER

MODEL 808-Complete, Ready to operate . . . $99.95 NET

MIDGETSCOPE
MODEL 533M
weighs only 9 lbs.
Size: 11¾" x 7¾" x 5⅛"
SENSITIVITY—Vertical .20 millivolts (.020 volts for 1" rms deflection on CRT face.) Horizontal—.6 volts.

MODEL 533M-Complete, Ready to operate . . . $99.50 NET

Write for the latest RCP Catalog to Dept. SM-11

RADIO CITY PRODUCTS CO., INC.
152 WEST 25th ST • NEW YORK 1, N. Y.

TV Parts . . . Accessories

COLUMBIA LOW-LOSS UHF COAX

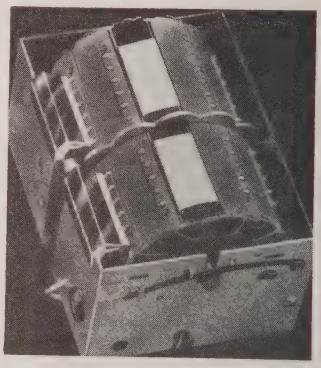
A low-loss cable, developed by Anaconda for *uhf* TV reception, is now available from the Columbia Wire and Supply Co., 2850 W. Irving Park Rd., Chicago, Ill. Cable is of semi-solid construction and features 22-gauge copperweld conductors, suspended polyethylene tubes within a heavy virgin polyethylene jacket of special design.

* * *

CONRAC TV TUNER-CLEANER UNIT

A *Tuner 'Kleen'r* unit that can be installed in all standard turret-type TV tuners, and which is said to clean both rotating and stationary contact points, has been introduced by Conrac, Inc., 649 W. Foothill Blvd., Glendora, Calif.

Unit consists of a plastic back, covered by nylon which in turn is impregnated with a special cleaning agent. Installed in the tuner by removing a pair of the unused tuner strips and substituting cleaning unit. Cleaning of the contact points is said to occur with each turn of the tuner knob by the set owner. Life expectancy of the unit is claimed to average from 2 to 4 years.



* * *

UTL PATTERN GENERATOR

A pattern generator, *CB-101*, for testing TV receivers and picture tubes, has been announced by the United Technical Laboratories, Morristown, N. J. Instrument may be connected to several TV chassis points for adjustment data, or used as a test pattern source to modulate TV signal generators.

Generator acts either through a receiver's video system so that horizontal or vertical lines are produced on the picture-tube screen, or tests the over-all response when used to modulate a TV signal generator. Generator may also be connected directly to TV picture-tube pins so that tube operation may be checked without removal of the receiver chassis from its cabinet. Special leads and connectors are supplied for connecting the instrument to the video amplifier or picture tube pins.

PIONEER TV COVERAGE CALCULATOR

A slide-rule TV signal-range calculator, designed from the FCC TV signal-coverage charts, is now available from the Pioneer Electric Supply Co., 2139 Prospect Ave., Cleveland 15, Ohio.

Calculator shows the approximate grade *A*, grade *B* and city coverage for all *vhf* and *uhf* TV channels.

With this calculator, a TV Service Man can, it is said, estimate signal strength from 5 to 100 miles, and have a sound customer-convincing basis for his recommendations as to type of antenna and accessories needed for a successful TV fringe installation. Accuracy is claimed to be within 5% of the actual FCC charts.

VEE-D-X UHF FRINGE ANTENNA

An antenna, known as the *Ultra Q-Tee Suburban* (*UQT-S*) identical to the *2-83 Ultra*, except that the *uhf* V portion of the antenna is replaced by an 8-element *uhf* yagi, has been added to the *Vee-D-X* line.

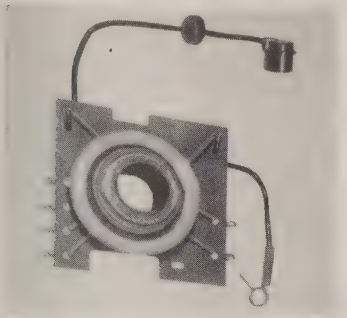
Model was said to be developed for critical areas and also fringe areas which will exist under initial low power *uhf* stations coming on the air. The *uhf* portion of the antenna is a high-gain, broadband yagi designed for the specific areas in which it will be used. Requires a single transmission line and includes eight printed circuit channel separators under license AAK patents 2,422,458, 2,282,292 and 2,611,086.

HALLDORSON FLYBACKS

Horizontal flybacks, *FB405* and *FB406*, that are said to be replacements for 115 or more popular TV models made during the past two or three years by Admiral, have been announced by Halldorson Transformer Co., 4500 North Ravenswood Ave., Chicago, Ill.

Units supplied wired to insulating terminal boards with exact-length plate leads and clips attached. To this coil assembly the Service Man can affix ferrite core pieces and mounting brackets taken from the defective parts being replaced. Instructions and a kit of material, including extra *hv* filament lead, are supplied with each unit.

Form 108, an illustrated bulletin completely describing these two new units, is available from Halldorson distributors, or direct from the manufacturer.



* * *

G-C CHEMICAL SERVICE AIDS

Two chemicals, one for TV and radio receivers, *De-Noiz*, and the other for magnetic recorders, *Mag-netik Head Cleaner*, have been announced by General Cement Manufacturing Co., Rockford, Ill.

Product for TV and radio is a liquid designed to be applied with a bulb-type applicator to radio and TV controls as volume controls, detents, tuners, switches, relays and contacts, where it will dissolve corrosion and oxidation and stop noise. Chemical for magnetic recorders is a liquid that is similarly applied to the recording heads of tape and wire recorders where it aids in preventing the accumulation of scum, oxides and other residue that can effect the recording operation. Both liquids are supplied in two-ounce sealed bottles.

* * *

IDEAL TEST LIGHT

A pocket-size neon tester, *Test-Glo*, that it is said can be used for checking electric circuits, spark plugs, motors, fuses, etc., has been announced by Ideal Industries, Inc., 4486 Park Ave., Sycamore, Ill.

Enclosed neon test lamp glows on 80-600 *vac* or *dc*, with intensity indicating relative voltage. Tester includes 24" lead wire between test prods, 5" prod handles, 10,000-volt lead wire, and safety rings on prods.

Quality and Reputation sells antennas too!

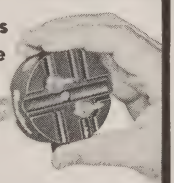
Many motor cars look the same, but there's a difference . . . and there's a difference in TV antennas too! Be sure of sales . . . use the antenna folks know for quality . . . they use in 1 out of every 6 installations . . . the Radion Metropolitan! It's the *original* indoor antenna and still the best seller.

Because Radion is built better, easiest to install, simplest for customer to operate, Radion saves your profits. Deliveryman or customer installs it . . . service calls are minimized. Customers are pleased because Radion does the job . . . and keeps TV set price low.

Sell quality and you sell satisfaction . . . specify Radion, best selling because it's best!

Radion's New Lightning Arrester Fits All Twin Leads, Mounts Anywhere

Now, one arrester is all you need carry! Phenolic model at $1 list; deluxe Porcelain is $1.50 list. Counter-packaged low-priced to give you volume sales!



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Mandl's

Television Servicing

Here are detailed, illustrated instructions for locating and correcting EVERY flaw or failure that may occur in each stage of today's TV receivers. You'll learn simple signal tracing procedures; trade tricks in diagnosing troubles in minimum time; the essentials of successful VHF and UHF servicing; how to trouble-shoot A.G.C. circuits, synchroguide circuits, and all other circuits, including the latest improvements. A complete master trouble index enables you to QUICKLY find the cause of and procedures for correcting any trouble, including those hard-to-find troubles. Hundreds of diagrams, original photographs of flaws as they appear on the TV screen, oscilloscope patterns and other illustrations further aid you in locating trouble, testing, and making adjustments.

Noll's

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Very clear, thorough, non-mathematical explanations of the function and operating principles of every element and circuit in TV reception; how the receiver is constructed; basic principles of transmission; and the techniques of installing, adjusting, and aligning today's receivers, with full instruction on test equipment and its use. Here, in the simplest, clearest terms, is the basic knowledge that is a MUST for good TV work.

AND

Noll & Mandl's

Television and FM Antenna Guide

Are fringe area reception, ghost reception, interference your problems? This book shows you how to overcome them—how to improve gain; minimize noise on the transmission line; get the MOST out of the antenna system at any location. It tells how to determine the right type of antenna for the site and the best position for it; gives full data on all types of antennas including those for the new UHF and VHF locations, yagi antennas, stacking, boosters, and other fringe area aids.

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Rep Talk

H. A. CHAMBERLIN Co., Boston, Mass., has been appointed rep for United Technical Laboratories, in the New England states and New York to the Westchester and Rockland county lines. . . . *E. L. Berman Co.,* 758 Natoma St., San Francisco, Calif. (northern California and Nevada, except Las Vegas county), and *E. E. Scott,* Atcheson and Adams, P.O. Box 157, Nashville, Tenn. (western Tennessee, Alabama, Mississippi), have been named reps for Perma-Power Co. . . . *Neely Enterprises* has moved its Sacramento office to 1317 Fifteenth St. . . . *Lee. B. Naylor Co.,* 1250 First Ave., South, Seattle 4, Wash., has been appointed rep for James B. Lansing Sound, Inc., in Oregon, Washington and British Columbia. . . . *Jack West,* Chicagoland senior rep has moved to a new office at 6153 N. Milwaukee Ave., Chicago 30, Ill. . . . Southwestern chapter prexy John Crockett has announced that the *Fourth Annual Southwestern Electronic Conference* will be held in January '53, at the Fort Clark Ranch, Brackettville, Texas. . . . *R. D. Mosher Co.,* 49 Colby St., Needham, Mass., has been named rep for General Cement Manufacturing Co., in the New England territory. Mosher will also represent the Merit Coil and Transformer Corp. in the same area. . . . *Frank A. Emmet Co.,* 2837 West Pico Blvd., Los Angeles 6, Calif., has been reactivated as a manufacturer's rep in a 4-state area: California, Arizona, Nevada and New Mexico. . . . *Ken C. Burcaw,* formerly sales manager for Cornell-Dubilier, has been appointed a rep for John F. Rider, Publisher, Inc., in the state of Michigan. . . . *Art Cerf and Co.,* 1144 Broad St., Newark, N. J., has been named rep for the Halldorson Transformer Co., in New England, metropolitan and upper New York, New Jersey, Eastern Pennsylvania, Maryland, Delaware, Washington, D. C. and Virginia. . . . *Neal Bear Corp.,* West Richfield, O., will also represent Halldorson in Ohio, Michigan, Western Pennsylvania and West Virginia. . . . *Newhope Corp.,* 6 E. 39th St., New York, N. Y., has been appointed national reps for Vidaire Electronic Manufacturing Co. . . . *Earl K. Moore,* 562 Silzler Ave., New Orleans, La. (Louisiana and Mississippi); *R. A. Adams,* 17636 Edinborough Rd., Detroit, Mich. (Michigan); *Edward Hoffman,*

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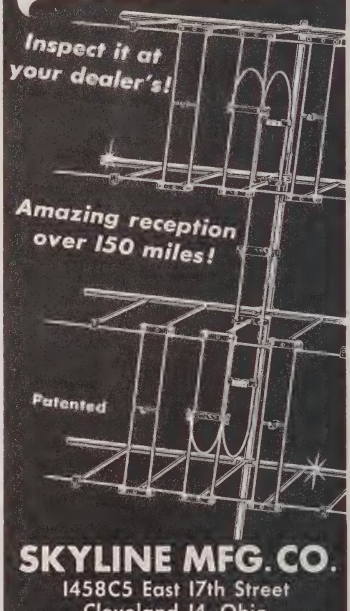
"SKYLINE"

all-channel performance secret

For the same reasons you *spray* your antenna connections, we have *eliminated* them!

Our continuously formed antenna elements provide maximum signal gain—and maintain it indefinitely, because they eliminate 80% of the number of element connections common to this type.

The performance is assured. That's why the pre-assembled, foldable, quick-rig, all-aluminum SKYLINE colinear antenna is fast replacing all other types in fringe areas.



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For TV, FM and Amateur Transmission Line

- Fits Any Wall Up to 13" Thick!
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- MOSLEY Lead-In Socket Can Be Mounted Direct to Inside Plate!
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- Easily, Quickly Installed!

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List Price..... **$1.95**

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WALL-THRU, complete with MOSLEY Universal TV Lead-in Socket and Plug. List Price $3.00

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1641 Scheffer Ave., St. Paul, Minn. (Minnesota); *S. W. Goodman,* 32 W. Biddle St., Baltimore, Md. (Maryland, Washington, D. C. and Virginia); *Robert Amos,* 2014 Dudsbury Circle, Dallas, Texas (Oklahoma, Texas); *Jerry Rogers,* 104 Catalpa Terrace, Springfield, Mass. (Massachusetts, Connecticut, Rhode Island, upper New York); *Eugene R. Loeb,* 5052 N. Shoreland Ave., Milwaukee, Wis. (Wisconsin); *Leonard Minthorne,* Weatherly Building, Portland, Ore. (Oregon and Washington); *Robert O. Whitesell,* 2202 E. Washington St., Indianapolis, Ind. (Indiana, Kentucky); *A. W. Arnold,* 1321 Rosedale Ave., Chicago, Ill. (Illinois); *Richard Osborne,* 1044 South Parkview, Los Angeles, Calif. (southern California); *Sherwood French,* 721 Garland Dr., Palo Alto, Calif. (northern California); *Walter Brauer,* 15631 Lakewood Heights Blvd., Cleveland, O. (western Pennsylvania, Ohio, West Virginia); and *Tom Cox,* RD 1, Greenlane, Pa. (eastern Pennsylvania, Delaware), have been appointed reps for Miller TV Co. . . . An *information and message center,* equipped with a 6'x6' screen on which were flashed names of people for whom messages were being held, was a service of the Chicagoland chapter of the Reps at the 8th Annual National Electronics Conference held at the Hotel Sherman recently. . . . *Howard W. Schinlever* and *John P. Gaffigan* have been appointed to the staff of *Dan. J. Connor Co.* Schinlever, who has been with the Minneapolis-Honeywell's Brown Instrument division, will handle accounts in metropolitan Philadelphia and eastern Pennsylvania areas. Gaffigan, a graduate of the U. S. Naval Academy and who recently retired from active duty, will cover the southern New Jersey, Delaware and Maryland territories. . . . *James Pickett* has been reelected president of the New York chapter of the Reps. Others elected include: *Jules J. Bressler,* first vice president; *William Hicks,* second vice president; and *Wally Shulan,* reelected secretary-treasurer, *John Kopple* has been elected to the board of governors replacing Frank Brennan who has retired. *Al Gary, Carroll Banfield* and *Richard Gentry* have been voted into the organization. . . . *Stan Cluphf and Associates,* Denver, Colo. (Colorado, New Mexico, Utah, Wyoming); *Johnny Maynard* (Arizona), have been appointed reps for Radio Merchandise Sales. . . . *John J. Killelea* and *Wesley M. Hague, Jr.,* have joined the staff of Walter T. Hannigan Co., 43 Leon St., Boston 15, Mass. *Harry A. Lasure,* whose new headquarters are at 9041 W. Pico Blvd., Los Angeles, Calif. (California, Arizona, Nevada); *Dave and Jim Packard,* with offices in Fort Smith, Arkansas and Houston, Texas (Texas, Arkansas, Oklahoma and Louisiana), and *John R. Tilton,* Toronto, Canada (eastern Canada), have been named reps for Electrovox Co., Inc.

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2. **REACTIVATING**—you can save many dim or worn out tubes by reactivation.
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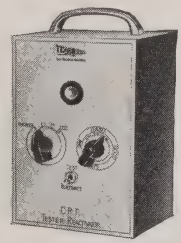
CRT TESTER-REACTIVATOR-SPARKER

***3 Instruments in 1,* making a complete CRT testing and repair unit. Compact, dependable, profitable.**

It's a combination of the Transvision TESTER-REACTIVATOR plus A SPARKER in one handy instrument. It *TESTS PICTURE TUBES*—measures Cathode emission, locates shorts between elements, locates high resistance shorts or leakage as high as 3 megohms. *REACTIVATES DIM TUBES. SPARKS OUT ELECTRICAL LEAKAGE* in picture tubes. Fully Guaranteed ..... **$34.95 net**



CRT TESTER-REACTIVATOR

2 Instruments in 1. As a REACTIVATOR it renews brightness, sharpness, and detail of old dim CR Tubes, without removal of tube. It's also an accurate TESTER: *Measures Cathode emission, locates shorts between elements, locates high resistance shorts or leakage as high as 3 megohms.* 110V-60 cycles; wt. 3 lbs. Fully Guaranteed. ..... **$19.95 net**

CRT TESTER-SPARKER

2 Instruments in 1. As a PICTURE TUBE SPARKER, it sparks out electrical leakage between elements. *Saves many picture tubes and small tubes* which would usually be discarded. Cathode-grid leakage is an especially common occurrence. The *Sparker* also gives a rapid check of gas condition of the tube.

As a TESTER it provides a variable 8,000-14,000 D.C. supply—useful for analyzing hard-to-solve deflection problems. Fully Guaranteed. ..... **$25.95 net**

FIELD STRENGTH METER for better TV installations.

Make more efficient, more profitable TV installations, and save half the work, with the Transvision Field Strength Meter. *Especially good for fringe areas* — measures field strength as low as 10 microvolts. A great buy at this low price.
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TECHNI-TOPICS

By LEN MAZEL

Gain vs. Noise

A low gain, low noise picture will admittedly be watery but will be clearer by far than a high gain, high noise picture, where noisy snow has degraded picture values, obscured the outlines of major masses and entirely obliterated fine details.

Servicemen have come to realize that adequate engineering is important to assure that booster installation does not do more harm than good because of excessive noise.

Although there are other means, noise specifications are usually given directly in terms of "S/N" (signal-to-noise ratio), or as "F" (noise-figure). Noise figure is defined as:

$$F = \frac{\text{ideal S/N power ratio}}{\text{actual S/N power ratio}}$$

Because of the reciprocal relationships involved, it is evident that a low noise figure is desirable just as a high signal-to-noise ratio is desirable.

Triodes are quite free of noise but tend to oscillate when strongly driven. Such oscillation can be prevented by neutralization but this is degenerative, and therefore would mean sacrificing gain. Pentodes do not require neutralization, but are nosier than triodes.

This was just one of many problems which ITI has had to face. Good gain was recognized as important, but less important than a low noise figure. The IT-102A *Auto*booster* solves this problem by using a string of triode stages, utilizing their outstanding gain and freedom from noise. The circuit design features grounded grids on all triodes, providing exceptional stability which prevents oscillations.

Write today for illustrated literature on the IT-102A *Auto*booster.

*Licensed under Allen B. DuMont Laboratories, Inc., patent rights.

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369 LEXINGTON AVENUE CLIFTON, N. J.
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Tools . . . Instruments Parts . . .

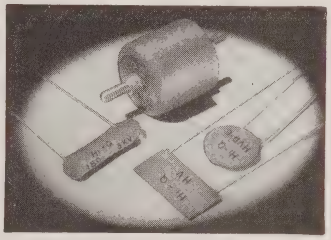
AEROVOX CERAMIC DISK-HV CAPACITORS

A total of 40 *Hi-Q*-type ceramic disk capacitors ranging from .00001 to .01 mfd for single-section units; from .001 to .004 mfd for two-section units; and .0015 and .002 for three-section units, have been announced by the Aerovox Corp., New Bedford, Mass.

Capacitors come in seven sizes for bypassing, blocking and coupling applications, and are also available for temperature compensating and where extended temperature compensating applications require a large gradient of capacitance versus temperature.

Voltage ratings of from 1 to 20 kv are also available in *Hi-Q* ceramic capacitors of the slug, disk, plate and tubular types. Terminals are silvered brass integrally soldered to silver electrodes fired directly to the ceramic dielectric. Insulation resistance is of the order of 50,000 megohms. Working voltage is 20,000 *vdc*, and flash test 27,000 *vdc*.

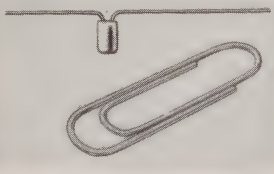
High-voltage tubulars have also been developed specifically for use in horizontal sweep and deflection sections of TV receivers, and come in standard capacitances from 4.7 to 1000 mmfd, voltage pulse ratings of 1 to 7 kv and capacity tolerances of ± 5%.



* * *

INTERNATIONAL RECTIFIER SELENIUM DIODES

Two subminiature selenium diodes, *1S1* and *5U1*, have been developed by the International Rectifier Corp., 1521 East Grand Ave., El Segundo, Calif. Type *1S1*, 0.10" wide by 0.21" long, is rated for a maximum input of 26 *v rms* at 100 microamperes output, while type *5U1*, 0.30" wide by 0.25" long, is rated for 130 *v* maximum at 1.5 ma. Can be used to obtain bias of about 100 *v* when connected directly in line.



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STATEMENT OF THE OWNERSHIP, MANAGEMENT AND CIRCULATION REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233)

Of SERVICE published monthly at New York, N. Y. for October 1, 1952.

1. The names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher: Bryan Davis Publishing Co., Inc., 52 Vanderbilt Ave., N. Y. C. 17; Editor: Lewis Winner, 245 W. 107th St., N. Y. C. 25; Managing Editor: None; Business Manager: B. S. Davis, Ghent, N. Y.

2. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member, must be given.)

Bryan Davis Publishing Co., Inc., 52 Vanderbilt Ave., N. Y. C. 17; B. S. Davis, Ghent, N. Y.; M. T. Davis, Ghent, N. Y.; J. C. Munn, 2253 Delaware Dr., Cleveland 6, Ohio; P. S. Weil, Great Neck, L. I., N. Y.; F. Walen, Teaneck N. J.; G. Weil, Great Neck, L. I., N. Y.; L. Winner, 245 W. 107th St., New York 25, N. Y.

3. The known bondholders, mortgagees, and other securuity holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)—None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

(Signed) LEWIS WINNER, Editor

Sworn to and subscribed before me this 26th day of September, 1952.

(Seal) Catherine C. Pons, Notary Public

B-M MULTI-PURPOSE LAMP

A multi-purpose lamp, that has a non-breakable adjustable metal reflector and an on-off switch type socket attached to a metal clamp, has been introduced by the B. and M. Electric Co., 675 Hudson St., New York 14, N. Y.

Unit includes a 10-watt bulb, 6' cord and molded plug.

* * *

TERADO AUTO DC-TO-AC CONVERTER

A portable converter, *Trav-Electric Super,* model *6-71160,* that converts 6 *vdc* to 110 *v* 60-cycle *ac,* when plugged into a auto cigarette lighter, has been developed by The Terado Co., 1068 Raymond Ave., St. Paul 8, Minn.

Converter capacity is 60 watts continuous and 75 watts intermittent.

* * *

RCA 5-INCH 'SCOPE

A five-inch 'scope, *WO-88A,* has been announced by the RCA tube department, Harrison, N. J. Included is a 10-megohm probe with an input capacitance of less than 10 mmfd.

Instrument is said to provide a square-wave response up to 50 kc, peak-to-peak voltage measurements and waveshape observations on a front panel terminal which affords a one-volt peak-to-peak reference voltage, and a green graph screen which is scaled in peak-to-peak voltage divisions.

Also featured are plus and minus sync; 60-cycle sweep and phasing; a shield around the picture tube gun to minimize hum pickup; push-pull circuitry in both stages of the vertical amplifier; direct coupling to provide quick recovery time and a frequency response flat down to *dc.* In addition, instrument is said to have a deflection sensitivity of 25 *rms* milli-volts or better per inch; a frequency response flat from *dc* to 500 kc within —3 db and within —10 db at 1 mc; and a sweep-circuit frequency of 15 cps to 30 kc in four ranges.

You can be sure of customer satisfaction--especially in fringe areas--if the TV set you sell is equipped with a

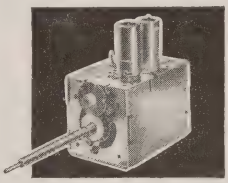
TARZIAN TUNER

Because so much depends upon the satisfactory performance of the tuning mechanism, many of the nation's leading set manufacturers use the

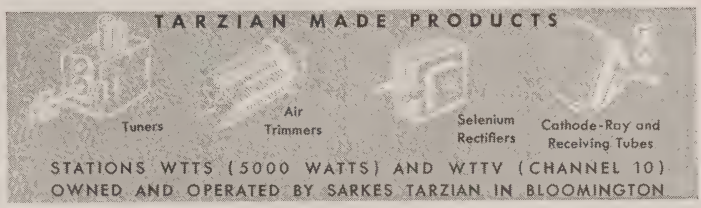
TARZIAN TUNER

in the television sets they produce, and sell, under their own brand names.

It's only natural that the world's largest producer* of switch-type tuners should produce the best UHF tuners for future, complete coverage reception.



*SARKES TARZIAN, Inc., Tuner Division,


TARZIAN MADE PRODUCTS
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Selenium Rectifiers
Cathode-Ray and Receiving Tubes
STATIONS WTTS (5000 WATTS) AND WTTV (CHANNEL 10)
OWNED AND OPERATED BY SARKES TARZIAN IN BLOOMINGTON

SMITH COAX SOLDERLESS FITTINGS

A line of coax solderless fittings, that use inner conductors of the cable for the male pin, have been introduced by Herman H. Smith, Inc., 436-18th St., Brooklyn 15, N. Y. All models are brass, silver-plated connectors for RG-8/U, RG-11/U, and RG-59/U.

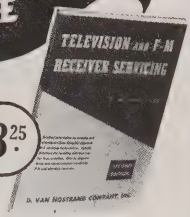
Available are: model *1650,* a male connector for RG-59/U, mating with *1660* receptable or *1680* cable coupler; model *1660,* a female receptacle with a threaded stem 5/8" long; model *1680,* a cable junction for RG-59/U, mating at either end with a *1650* connector; and model *1700,* a heavy duty cable adapter.

RUSH MIDGET WIRE STRIPPER

A miniature wire stripper, type *R Midget Stripper,* has been developed by the Rush Wire Stripper Division, The Eraser Co., Inc., 104 S. State St., Syracuse 2, N. Y.

Specially designed for removing film insulations from wire ranging from AWG 50 to AWG 40 inclusive, stripper uses 5/8" *FybRglass* wheels which are said to develop sufficient frictional heat to melt the insulation and then wipe away the residue, permitting removal of the insulation without scoring or breaking the wire. Design is claimed to be such that the leads can be stripped up close to the coils.

YOUR BEST TV SERVICING GUIDE



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gives you practical information on antennas and transmission lines, complete alignment and servicing instructions. How to diagnose, locate, and correct common troubles as well as install sets for best reception. 248 pages, illustrated.

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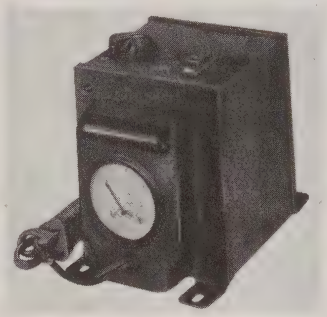
(S-1152)

HALLDORSON VARIABLE AUTOTRANSFORMERS

Four autotransformers, *J4400-1-2-3 Varivolt,* for adjusting line voltages of 65, 75, 90, 100, 115, 130 and 145 to 115 volts, have been developed by the Halldorson Transformer Co., 4500 Ravenswood Ave., Chicago 40, Ill.

Voltage is set with a seven-step rotary switch and indicated by a voltmeter. Each unit is equipped with a 6′ line cord and standard output receptacle.

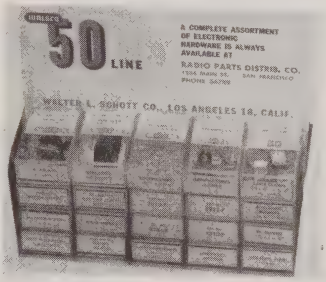


* * *

WALSCO STORAGE TRAY

A storage tray, designed to hold up to 20 sliding-lid plastic containers, is now available from the Walter L. Schott Co., 3225 Exposition Place, Los Angeles 18, Calif.

Descriptive label, showing the item and part number, appears on each plastic box for identification of all items stored in the tray. Tray can be mounted on the wall or placed on a shelf or work table.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A COMPLETE ASSORTMENT OF ELECTRONIC HARDWARE IS ALWAYS AVAILABLE AT
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WALTER L. SCHOTT CO., LOS ANGELES 18, CALIF.

CHASE CARBON-FILM RESISTORS

Two carbon film resistors, that are sealed in glass envelopes, evacuated, baked at high temperature under vacuum, and sealed in helium, have been introduced by the Chase Resistor Co., 9 River St., Morristown, N. J.

Units are said to be stable to .01% under all conditions, and have a drift of .01% per year or less. Can be supplied in network with ratios and temperature coefficients held to very close tolerances.

Resistors, made by solder-sealing in ceramic tubes with metallized ends, are also available.

BRIGHTEN YOUR SALES PICTURE With The New KINE-LITE Pat. Pending
Picture Tube Brightener & Rejuvenator

Only VIDAIRE'S Kine-Lite operates on ANY cathode ray picture tube of 10" and larger, including electrostatic focus.

VIDAIRE's Kine-Lite brings new brightness to TV picture tubes having low emission— permanent installation — can be re-used — simple instructions with each unit.

★ Renews brilliance and contrast of picture
★ Prolongs life of old picture tubes
★ Easy to install ★ No soldering necessary
★ For all standard tubes using duo-decal bases
★ No limit to tube size—10" to 30"
★ Standard Warranty ★ Two connecting plugs
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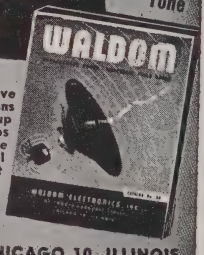
RECONE WITH A WALDOM CONE

A Waldom Cone for the Finest Tone



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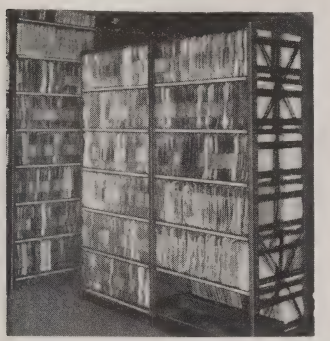
WALDOM ELECTRONICS INC., 911 N. LARRABEE ST., CHICAGO 10, ILLINOIS

EQUIPTO RECORD-STORAGE FILES

Steel storage files for records, as well as office supply storage and book shelving racks, are now available from Equipto, Aurora, Ill.

Units are equipped with front bases and finished in olive-green baked-on enamel, and are 3′ wide, 7′ or 10′ high. Shelves adjust vertically on 1½″ centers.



* * *

VACO TOOL-KIT GIFT PACKAGE

A driver kit, *X-4 Holiday Kit,* in a plastic-topped clear view box, which provides for the imprinting of the individual firm name on the tool bag as well as on the driver handle, has been announced by Vaco Products Co., 317 E. Ontario St., Chicago 11, Ill.

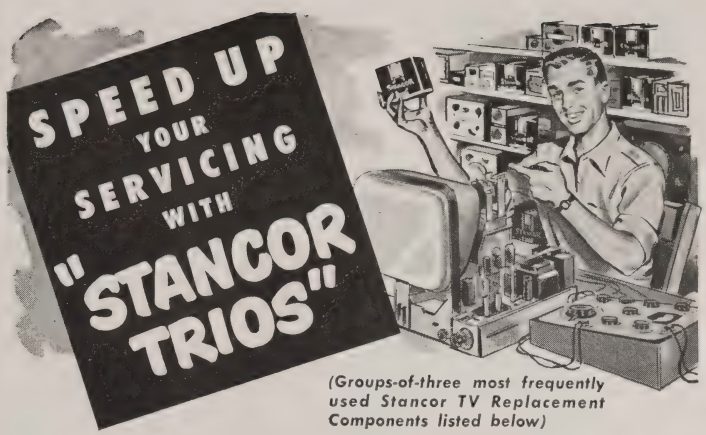
Offering consists of a 3/16″ regular X No. 1 Phillips reversible blade; ¼″ regular X No. 2 Phillips reversible blade; heavy duty interchangeable Amberyl handle, 1″ x 3⅝″; and plastic carrying case with suitable pockets for holding the blades and handle intact. The plastic-topped clear view box is 4⅛ x 6½ x 1⅛″.

* * *

TELE-MATIC PICTURE-TUBE EXTENSIONS

A line of picture-tube extensions, including anode, socket, 8-wire yoke extensions and two all-purpose kits for service and conversion work, has been announced by Tele-Matic Industries, 1 Joralemon St., Brooklyn, N. Y.

Available are: a 3′ anode extension, *CR-33,* both ends of which are made of rubber; *CR-33-6,* a 6′ anode extension; *CR-35,* a 3′ socket extension, with six leads for use with electromagnetic and electrostatic picture tubes, etc.



(Groups-of-three most frequently used Stancor TV Replacement Components listed below)

Don't Waste valuable time waiting for a replacement—carry it in stock!

STANCOR CHOKES	C-2325 C-2326 C-2327	COVER 70% of your TV REPLACEMENTS*
STANCOR DEFLECTION YOKES	DY-1 DY-8 DY-9	COVER 70% of your TV REPLACEMENTS*
HORIZONTAL DEFLECTION OUTPUTS	A-8127 A-8128 A-8130	COVER 45% of your TV REPLACEMENTS*
VERTICAL DEFLECTION OUTPUTS	A-8112 A-8115 A-8123	COVER 70% of your TV REPLACEMENTS*
VERTICAL BLOCKING OSCILLATORS	A-8111 A-8121 A-8122	COVER 65% of your TV REPLACEMENTS*

* Based on a statistical analysis of all replacement recommendations in the Stancor TV Replacement Guide.

Stancor Transformers are listed in HOWARD W. SAMS' Photofact Folders and JOHN RIDER'S Tek-Files.

FREE! Stancor's new 24-page catalog listing over 475 transformers and related components for all types of electronic applications. Includes over 100 TV units. Get your free copy from your Stancor distributor or write Stancor direct!

STANCOR

STANDARD TRANSFORMER CORPORATION

3588 ELSTON AVENUE, CHICAGO 18, ILLINOIS

MERIT TRANSFORMERS AND IF-RF COILS

Six power transformers and six *if-rf* coils, are now available from Merit Coil and Transformer Corp., 4427 N. Clark St., Chicago 40, Ill.

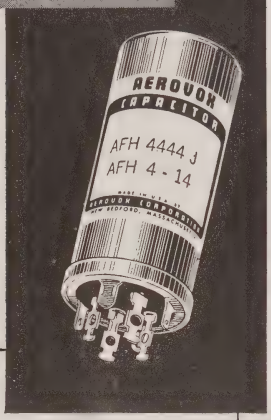
Transformers include types *P3076, P3077* and *P3078,* for low voltage-high current TV set designs; *P3079,* an isolation power transformer for sets such as Philco model 50T201 and RCA 17T151 which use selenium rectifiers; *P3097,* a damper isolation filament transformer with a primary of 6.3 *v,* and secondary 12.6 *v* at 1 *a* or 6.3 *v* at 1.2 *a*; and TV auto-transformer model *P3098,* a picture-tube voltage booster, with rating of primary 6.3 *v* and output of 12.6 *v* at 1 *a.*

UTL LIQUID PLASTIC IN PRESSURIZED CONTAINER

A clear liquid methyl-methacrylate plastic, *Plastik-707,* that is said to provide insulation for radio, TV and electronic components and wiring, and available in pressurized containers, has been announced by the United Technical Laboratories, Morristown, N. J.

Liquid plastic, which is applied as a spray to reduce electrical leakage and as a convenient means of preserving the bright metal finishes of many industrial products, is claimed to be unaffected by exposure to acids, alkalis, chemical fumes, sun, weather or salt spray. Supplied in pressurized twelve-ounce cans or in bulk in pints, quarts and gallons, without pressure for brush application.

FOR THOSE
HOT SPOTS
AEROVOX AFH
ELECTROLYTICS



Especially for elevated temperatures and high ripple currents, particularly in TV applications.

Light weight. High capacitance. Compact container. And of course the handy twist-prong mounting and easily-wired terminals.

Single-, dual-, triple- and quadruple-section units. Connections clearly indicated on rear label. Expanded listings provide *outstanding selection* of voltages, capacitances, combinations.

Ask your distributor for Aerovox AFH electrolytics. Consult the Aerovox *expanded listings.*

AEROVOX CAPACITORS

FOR RADIO-ELECTRONIC INDUSTRIAL APPLICATIONS
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UHF/VHF Multi-Outlets

(*Continued from page 22*)

put of the mixer will contain the following signals: channel *21* converted to channel *2;* channel *27* converted to channel *4;* channel *6;* channel *8* channel *10;* channel *12.*

The selector, mixer, and amplifier[4] are mounted in a convenient location at the rear of the store. An amplifier is used to amplify the signal and distribute it through four 75-ohm RG59/U, coax feed lines. Each of these lines feeds a distribution transformer in a different section of the store, where the signals are again split four ways. From these units, the signals are fed to individual outlet boxes. Each outlet box contains a matching transformer to change the load impedance to 300 ohms to match the normal receiver input. The system provides for simultaneous operation of 16 receivers on all the channels that will be available in Portland.

[4]RCA Master-Tenna.

Servicing Helps

(*Continued from page 50*)

show a peak on the meter of 125-130 ma at both ends of its range. The point, in between, where the meter dips to approximately 90 ma with good horizontal linearity should be found; this will indicate the proper setting of the core. If this dip does not occur, a defective component is in the linearity circuit (C_{110}, C_{120} or the coil itself, L_{89}). The fuse should then be replaced.

National Sales Conclave

At the sixth Simpson Electric national sales conference held at the summer home of Ray Simpson, company founder, at Lac Du Flambeau, Wis.: Left to right: *Chief Fighting Wolf;* J. R. Back of Back Simpson Ltd., London, Ontario, Canada; Simpson prexy Wallace Carroll, and *Stalking Bear,* son of the Chief.

television receiver manufacturers are adding interference filters to antenna circuits of late model TV sets.

BUT . . . most receivers in use today are older models which do not have a built-in safeguard against TVI, and they're coming in for repair every day.

Now's your chance to assure your customers

Interference-free reception

by simply installing a Drake High Pass Filter in the antenna lead-in.

TV receivers, new or old, require a further safeguard against interference entering the set through the 110 AC line.

R. L. Drake Filters eliminate interference from both sources.

High Pass Antenna Filters
TV-300-50HP 20 Mc IF—300 ohm $5.95 List
TV-300-54HP 44 Mc IF—300 ohm 6.95 List
TV- 72-50HP 20 Mc IF— 72 ohm 5.95 List

Power Line Filter
LN-5 "Inductube" . . . $9.70 List

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XCELITE Hand Tools
PREFERRED BY THE EXPERTS

"Pack up your troubles in this roll kit bag!"

6-tool CK-3 Kit

You'll find the job goes faster and easier with XCELITE tools! This "CK-3" KIT comes in a durable plastic roll kit with 3 combination blades; including Nos. 1, 2 and 3 Phillips reversible to 3/16", 1/4" and 5/16" regular. All are made to fit the strong man-sized XCELITE handle. Ask your dealer today!

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For Originality LOOK TO XCELITE

CATALOGS, BULLETINS ETC.

RCA Victor Division, RCA, Tube Department, Harrison, N. J., has prepared a 142-page *Service Parts Directory, SP-1014,* containing schematics, parts lists, and top and bottom chassis views for 71 '50 and '51 RCA TV receivers. Receivers are indexed by model name, model and chassis number, and also include *rf* tuner chassis numbers.

* * *

Harry G. Cisin, 200 Clinton St., Brooklyn 2, N. Y., has published a 69-page book, *TV Consultant,* on TV troubleshooting and alignment. Book, through a copyrighted system, is said to diagnose TV troubles speedily, and then tells what steps are needed to remedy the trouble. Contains more than 125 illustrations and over 135 rapid checks. Priced at $2.00.

* * *

General Electric Co., Schenectady 5, N. Y., has released an 8-page booklet, *GEA-5699A,* describing the basic characteristics and applications of copper-oxide rectifier stacks. Booklet features charts, graphs, tables and circuit designs.

* * *

Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis., has issued a 32-page catalog, *28,* covering variable resistors, ceramic capacitors, rotary and lever switches, printed circuits and steatite insulators.

* * *

Utah Radio Products Co., Inc., 1123 E. Franklin St., Huntington, Ind., has made available a cross-reference transformer catalog, *T-100.* Catalog is said to match any Utah transformer to manufacturer's part, and includes reference charts supplemented by electrical and physical data for each item, together with tube applications for output transformers.

* * *

Supreme Publications, 3727 W. 13th St., Chicago 23, Ill., has released an index to their radio and TV diagram and servicing information manuals. Radio diagrams cover receivers from '26 to present, and TV diagrams from '47 to '52.

* * *

Greylock Electronics Supply Co., 115 Liberty St., New York 6, N. Y., has prepared an 8-page *TV and Radio Service Men's Bulletin* describing TV and radio tubes and parts. A 68-page '53 catalog will also be available shortly.

* * *

The La Pointe Plascomold Corp., 155 West Main St., Rockville, Conn., has released an eight-page catalog on *UHF Antenna Systems—How, What and Where for Every UHF Area.*

Brochure includes a page of questions and answers; data on the Vee-D-X *Mighty Match* for separating *vhf* and *uhf*; pages on newly developed *uhf* antennas; description of a universal mounting bracket; and details on typical installations that combine both *vhf* and *uhf.*

* * *

Transvision, Inc., New Rochelle, N. Y., has released a 4-page *Picture Tube Interchangeability Chart,* providing a list of TV picture tubes with their replacement types. Where direct replacement is difficult, notes are included showing changes necessary.

Your reputation as a skilled Service Man depends a great deal on your choice of replacement parts. The performance of replacement speakers reflects upon your ability and knowledge. Be sure the reflection is favorable. Specify Utah* speakers—and your customers will say "That Service Man Knows His Business!"

**All Utah speakers have exclusive Utah Universal Angle Mounting.*

FREE . . . WRITE TODAY FOR THE NEW UTAH REPLACEMENT SPEAKER CATALOG S201

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HUNTINGTON, INDIANA

A WHOLLY OWNED SUBSIDIARY OF NEWPORT STEEL CORPORATION

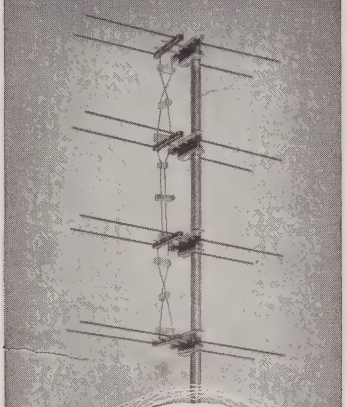
CORRECTION

In the Geist article on the synchroguide circuit, presented in the October issue of Service the information on page 26 was in error. To form one diagonal line the sync pulse must crawl through one sawtooth in one picture field or in 1/60 second. Therefore, each diagonal blanking bar represents a 60-cps difference from the synchronizing frequency instead of 30-cps as stated. When the sync pulse has crawled down one sawtooth the frequency of the horizontal oscillator is then $261.5/262.5 \times 15750 = 15690$ cps.

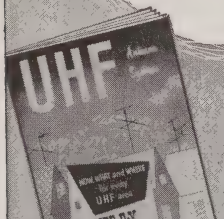
Table 1 Corrected

	Horizontal Oscilator Frequency	
Blanking Bars	*Bars Slanted to Right*	*Bars Slanted to Left*
1.....	15690	15810
2.....	15630	15870
3.....	15570	15930
4.....	15510	15990
5.....	15450	16050
6.....	15390	16110
7.....	15330	16170
8.....	15270	16230
9.....	15210	16290
10.....	15150	16350

Vee-D-X takes the lead in UHF—just as it did in VHF—with performance proven antennas for every UHF requirement. Shown below is the UHF Colinear by VEE-D-X. This high gain all-channel fringe area antenna is considered by one of the world's largest set manufacturers as the finest UHF performer yet perfected. Available also as side-by-side stacked array.



VEE-D-X
PERFORMANCE PROVEN
UHF
ANTENNA SYSTEMS



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UHF ANTENNA GUIDE
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Send.....copies of UHF Antenna Systems booklet

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CITY..... ZONE..... STATE.....

Auto Radio

(*Continued from page 26*)

operation will indicate that the vibrator is worn out and should be discarded, or the contacts of the vibrator have been oxidized and should be cleaned before proceeding with the test.

Vibrator contacts can occasionally be cleaned by passing a 60-cycle current through the vibrator coil and contacts.* Extreme care must be employed when using this technique by providing a suitable limiting resistor in series with the input.

After the contacts have been cleaned, the vibrator should be reinserted in the tester. The calibrator button should be depressed and the input voltage raised until the meter needle coincides with the *test* line. The quality of the vibrator can then be determined by the position of the meter needle when the calibrator button is released. The meter has a separate calibration for interrupter and self-rectifying vibrators.

*Heller, Solomon, *Auto Radio Vibrator Servicing,* SERVICE; October, 1952. See *Servicing Helps,* this issue, page 46.

Table 1: Operating precautions and notes

Always use a rectifier tube when testing interrupter vibrators.

Always remove rectifier tube when testing self-rectifying vibrators.

Always use heavy short leads to connect power supply to the vibrator tester.

Never operate more than one vibrator at a time in the tester. All vibrator sockets should be cleared except the one in use.

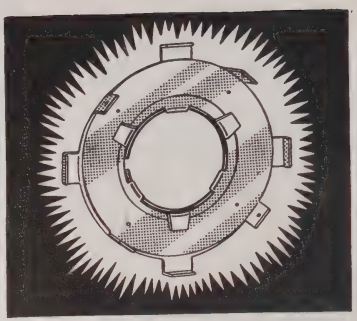
Reversible self-rectifying vibrators may require repositioning in socket to insure normal operation.

When in doubt, the *separate drive-shunt drive* switch should be tried in both positions.

* * *

WESTINGHOUSE NAMES NEWCOMB TV-RADIO DIVISION MANAGER

T. J. Newcomb has been appointed manager of the television-radio division of Westinghouse, with headquarters at Sunbury, Pa. Newcomb, who was formerly sales manager of the appliance division, Mansfield, Ohio, succeeds *F. M. Sloan,* who was named manager of operations for the television-radio division, and will be responsible for all the defense business of the division. He will also be responsible for the engineering and manufacturing of both defense and consumer products for the division.



CENTER TV PICTURES
IN 3 SECONDS
with the
PERFECTION
Beama Juster

1. Snap BeamaJuster on back cover of tube yoke. (Fits any standard yoke and any size tube.)
2. Rotate BeamaJuster as shown here for approximate centering of picture.
3. Make final adjustment by sliding outer plate of BeamaJuster vertically or horizontally.

Order today from your supplier!
PERFECTION ELECTRIC COMPANY
2635 South Wabash Ave., Chicago 16, Illinois
Makers of Perfection Speakers, Ion Traps and B. O. (Barkhausen Oscillation) Eliminators.

VEE GOT IT!

Check these tube prices against your last purchase order. We're positive you can't beat these prices for branded tubes, *fully guaranteed* and individually boxed.

1B3	.68	6BE6	.49	12AT7	.73
1X2	.68	6BQ6	.90	12AU7	.57
5U4	.45	6C4	.40	12BA6	.48
6AG5	.56	6CB6	.56	12BE6	.48
6AK5	1.15	6CD6	1.79	12SA7	.57
6AL5	.45	6J5	.40	12SN7	.57
6AQ5	.51	6J6	.71	19BG6	1.44
6AT6	.41	6K6	.48	25BQ6	.90
6AU6	.45	6S4	.51	25L6	.50
6AV6	.41	6SN7	.57	35W4	.34
6BA6	.48	6T8	.83	35Z5	.40
6BC5	.56	6V6GT	.51	50B5	.38
6BG6	1.40	6W4	.49	50L6	.53

Jobber Inquiries Invited

All prices F.O.B., N. Y. Min. order $5.00. C.O.D.'s, of course. 25% deposit with order. Prepaid shipments if check in full with order.

VEE
Box 134, Queens Village 29, N. Y.

UHF Lines

(*Continued from page* 25)

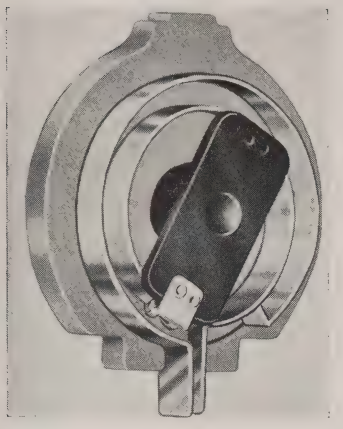


Fig. 8. Variable length of line tuning method used in Mallory *uhf* Inductuner.

time leave the line open circuited. Since we have cut off the line at a point where there is minimum current the standing waves on the remainder of the line will be unchanged, and the *rf* oscillator will notice no difference. This leads to the conclusion that the length of shorted line cut off must appear to be a parallel tuned circuit. Thus, we can conclude that a quarter-wavelength shorted line behaves like a parallel-tuned circuit.

Quarter-Wave Lines

Again, let us consider the original shorted line, now placing a short across the line at point *C*. It will be noted that the standing waves will be unchanged, except that there will be no current or voltage beyond point *C*, so it will be necessary to cut off the length of line beyond point *C*. The removed half wavelength shorted line looks like a short circuit or series-tuned circuit. It can also be shown by similar reasoning that a half-wavelength open-circuited line looks like an open circuit or parallel-tuned circuit. In short, a quarter-wave line will transform from a low to a high impedance or vice versa, while a half wavelength of line will repeat the same impedance at its input end as is connected at its output end.

UHF Tuned Lines

The lines used as tuned circuits are generally shorter than the theoretical quarter or half wavelength long, because of stray and fixed capacitance. The tuning circuits used in *uhf* TV tuners and converters are almost exclusively of the transmission line type, since conventional lumped constant circuits become extremely small and have poor *Q* in this band of frequencies. Tuned lines are usually made of silver plated flat or round bars using air dielectric plus a minimum of solid-dielectric material to obtain a high *Q* and better selectivity. The lines are tuned either by changing the effective length of the line or by using a variable capacitor to tune a fixed length of line, or a combination of both tuning methods.

Dependability . . .

an important reason why leading manufacturers prefer General Industries' 3-Speed Phonomotors

Year after year, General Industries' *Smooth Power* Phonomotors provide trouble-free performance—backing up fine radio, television and record-changer engineering with highest quality motor design and construction.

Write for complete information, including specifications, design features and dimensions. Quantity price quotations available on request.

THE GENERAL INDUSTRIES CO.
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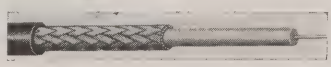
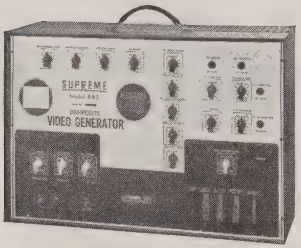
Fig. 9 (above), Tubular twinlead (type 14-271) which is said to have a 1.25-db attenuation at 100′ at 100 mc and 4.2-db attenuation at 900 mc. Below: RG/58U coax.

(*Courtesy Amphenol*)



Test-Adjust Television Sets at YOUR Convenience

Even Without Station Test Pattern or in Remote Weak Signal Areas



Every TV station sends a COMPOSITE VIDEO SIGNAL when telecasting a program or a test pattern. This COMPOSITE VIDEO SIGNAL is composed of—(1) a synchronizing and blanking signal to lock the free running raster into a frame of two interlaced fields, and —(2) a video signal to control the amount of light and produce the picture (which may be a program scene or a test pattern for analysis purposes).

A television set will produce a picture only when it is supplied with a COMPOSITE VIDEO SIGNAL. To check any TV set properly, you must have a COMPOSITE VIDEO SIGNAL.

Why lose time and money waiting for that ideal scene or test pattern to check a TV set? In fringe or weak signal areas, you are strictly in the "driver's seat" with a SUPREME COMPOSITE VIDEO GENERATOR. Write SUPREME, INC., Dept. 4, GREENWOOD, MISSISSIPPI for descriptive folder.

SUPREME MODEL 665

Net Price $389.50

The SUPREME COMPOSITE VIDEO GENERATOR provides the same type of sync and blanking signal as the TV station—even the equalizing pulses. In addition, it incorporates a video section which generates a special test pattern for analysis and adjustment of TV sets. Other patterns or pictures can be presented by using auxiliary equipment connected to the special "gated" video input section of this versatile instrument. The Model 665 should not be confused with the cross-hatch or bar-pattern generators. The Supreme Model 665 supplies a COMPOSITE VIDEO SIGNAL.

Since 1927

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"SUPREME BY COMPARISON"

TUBE TESTERS • OSCILLOSCOPES
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How to Read Schematics

(*Continued from page 29*)

model RA109A. On the overall schematic, the following switching positions information is provided: "Switch sections viewed from front end of switch. Rotor in extreme *CCW* (AM) position. Switch positions are *1*—AM; *2*—Phono; *3*—FM; *4*—TV, light on; *5*—TV, light off."

CCW, of course, means counter-clockwise. Once the identifying switch position data are read carefully, then each switch segment can be analyzed in turn. As part of the analysis, it is also important to note the type of switch and how the contact is made between terminals on the switch; and the amount of rotation the rotor makes for each switching position.

In studying the switch schematic (Fig. 2; p. 28) the first point to note is that there are five switch positions. However, this means the switch can rotate only four times, since the starting position is the first or AM position and there are therefore only four more positions. The number of times the switch rotates is always *one less* than the *total number* of switch positions. This is obvious, but is often discounted in analyzing switch rotation.

An examination of the switch reveals two short terminals, *1* and *2*, which can only make contact with the extension or lip of the rotor. The longer terminals, *6* and *7*, are long enough to make contact with the narrow part of the rotor segment when it comes into position. Another long terminal, *4*, is the common and always makes contact with the rotor. This will be noted by visualizing four clockwise rotations of the switch. Terminal *4* serves to keep contact with the rotor during the complete rotation. A long terminal can, of course, make contact with the wide portion as well as the narrow portion of the rotor if the switch is rotated sufficiently. However, only on one switch position (TV, light on) does a long terminal (*4*) make contact with this portion of the rotor.

It will be noted that in this segment (Fig. 2), there are some missing switch terminals. As the next step therefore, in analyzing the switching, it is helpful to draw in lines with a pencil so that the amount of switch rotation can be accurately seen. Fig. 3 illustrates how to add pencil lines for this purpose, dotted lines having been placed to show missing switch terminals. Additional lines have also been placed on the rotor, spaced one switch position apart. This will be found helpful in visualizing how far the switch will turn for each rotation,

and what part of the switch will make contact with which terminals. In table *1*, appears a summary of the contacts on various switch positions, detailing which parts of the switch rotor make contact with which terminals on each switch position. The electrical result is also noted in this table. Once the principles of switch operation are mastered, the connections for each switch position can be visualized readily. If necessary, however, the connections for each switch position can be either listed or drawn out to help analyze the action.

In Fig. 5 (p. 29) appears another illustration of a switching arrangement, found in the Stromberg-Carlson series 116-C—116-T. The information on this schematic notes that the . . . "Range switch shown in middle (high band) position, with control terminals toward bottom." This model uses a front end with two sections; one for high-band and one for low-band operation.

The segment of the switch under analysis has the switching arrangements for this front end. Since the connections can be somewhat confusing, the next step is to trace each wire to its source and label it, as indicated in Fig. 4 (p. 29). Now, it is possible to make the usual analysis of the shape of the rotor and its relation to the switch terminals.

As shown in Fig. 4 the terminals are connected to it: (*1*) Plate and screen of high band *rf* amplifier; (*2*) $B+$ through R_{25} and the focus coil; (*3*) plate and screen of the low band *rf* amplifier; (*4*) plates of both the low and high-band converters; (*5*) plate of high-band oscillator; (*6*) $B+$ through R_{12}, R_{82}, and the focus coil; and (*7*) plate of the low-band oscillator.

It will be noted that switch terminal *4* is the only long terminal. In addition, it acts as a *common*, making contact with rotor *A* on all three switch positions. (All long terminals do not always act as *commons*, however, as can be seen in Fig. 2.)

All of the other terminals are short and can only make contact with the wide area of rotor *A* with or rotor *B*. In the present position, the following is true:

Terminal *1* is in contact with *2* through rotor *B;* connects plate and screen of high band *rf* amplifier with $B+$.

Terminal *3* is not connected; plate and screen of low-band *rf* amplifier are open and therefore this stage is inoperative.

Terminals *4*, *5*, and *6* are connected together through rotor *A;* plates of both the low and high band converters or terminal *4*, and the plate of the high-band oscillator or terminal *5*, are connected to $B+$ or terminal *6*.

Terminal *7* is not connected; plate of the low-band oscillator is open and therefore this stage is inoperative.

On the basis of this analysis, the switching arrangements become a simple matter to understand. In the illustrated position, the high band of the front end is energized. When the switch is turned for low-band operation (by clockwise rotation), the plate of the low-band oscillator (*7*) and the plates of the low and high-band converters (*4*) are connected to $B+$ (*6*), while the high-band oscillator plate (*5*) is not connected. Low band *rf* amplifier (*3*) is connected to $B+$ (*2*) while the high-band *rf* amplifier (*1*) is not connected and becomes inoperative.

On phono position, complete counterclockwise rotation (or one counterclockwise rotation from the illustrated position, as shown in Figs. 4 and 5) the only connections are between switch terminals *4* and *5*. It will be noted that both $B+$ terminals, *2* and *6*, are not connected to any of the other switch terminals. As a result, no $B+$ is fed to either section of front end. Thus, the entire front end is inoperative on phono.

[To Be Continued]

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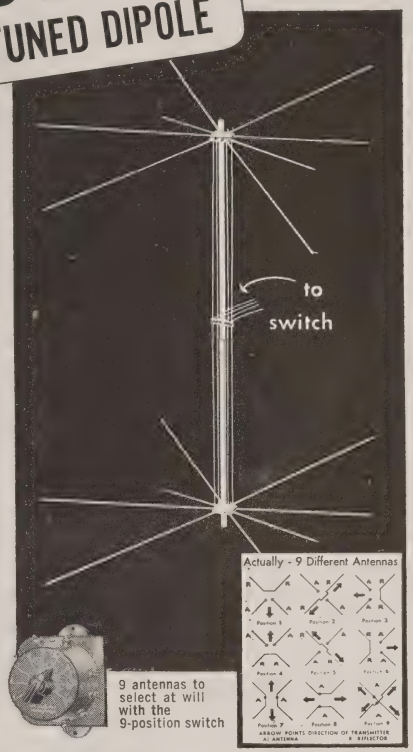

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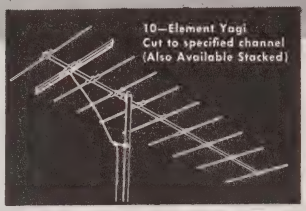

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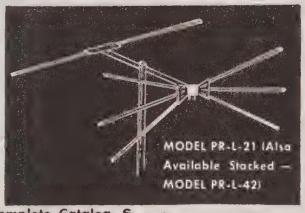

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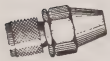

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Tuners in Hi-Fi

(*Continued from page* 39)

frequency *ac* and the station carrier. The introduction of this type of hum requires that a non-linear circuit element be present. As a result, the oscillator-mixer circuit, which is purposely operated in class *C*, to allow intermodulation between the carrier and the local oscillator, is especially susceptible. Cathode-filament leakage in this stage can be responsible for modulation hum, and the converter tube or tubes should be the first components to be suspected, even though they are normal in all other respects. An infallible check, for determining whether or not such leakage is responsible for modulation hum, is to disconnect the converter heater and to operate it temporarily from a 6-volt dry cell, noting whether the hum disappears.

Modulation hum may also be introduced in the antenna-ground circuits, where the non-linear elements are provided by oxidized joints between one side of the *ac* line and the earth. This type of hum is often eliminated by a line bypass capacitor or by a cold-water pipe connection to the chassis. An earth connection should never be made, however, to an *ac/dc* type chassis.

Other Sources of Noise

Noise induced from an outside source is sometimes beyond the control of the Service Man, but there is much that can be done in the attempt to eliminate or at least minimize disturbances of this nature.

If the source of noise is local—an electrical household appliance, oil burner mechanism, or some similar device—a little detective work may uncover the culprit. A good line filter installed *between the power outlet and the source of noise,* can then be used for effective noise suppression. This filter will prevent the *rf hash,* created by the noisy appliance, from being radiated by the power line, which tends to act as a transmitting antenna.

The location of the roof antenna may be profitably experimented with for elimination of noise, especially if the source is nearby. (The disturbance is sometimes traced to house elevator motors.) Directional FM antennas should be rotated to present their least sensitive side to the radiating source, and located as far from the street as possible to avoid picking up ignition noise from cars. Twisting the flat transmission line will also be

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helpful in preventing noise pickup by the antenna leadin.

FM receivers will not be static-free on the weaker stations if the various tuned circuits are not aligned correctly and if the set itself is not properly tuned. The owner of the set should be told that when tuning is done by ear the dial must be brought to the point of least background noise, rather than to the point of maximum volume.

Antenna Installations

An outside roof antenna is necessary for quiet and reliable FM reception in low-signal strength areas, but in most sections of metropolitan areas a builtin antenna will be found adequate, especially if the tuner has good sensitivity. A simple and effective indoor folded dipole can be made from 300-ohm lead (Fig. 5, p. 39) and tacked onto the back of the cabinet or to a wall baseboard. Even when a roof antenna proves necessary it is a good idea to provide a builtin dipole anyway, so that the owner can make use of it if he should move to an area with better reception. A socket and connectors may be installed at the back of the set and at the antenna leadins for simplifying the change from one type of antenna to the other.

When sensitive AM tuners are used in areas of high signal strength, an AM antenna of excessive length may cause overloading, whistles, repeat tuning spots, and other undesirable results.

Tuner Characteristics

In selecting a tuner the following desirable features should be sought: (*1*) Low distortion; (*2*) adequate *af* response; (*3*) low drift; (*4*) ease of tuning on FM; and (*5*) adequate sensitivity for the requirements of the area.

Tuner distortion is most often introduced in the detector or discriminator circuits, or in the audio stages following the *rf* section. The quality of the detector winding is very important in FM circuits, since it must have a high degree of symmetry between the halves. Correct alignment is also very important for low distortion. The manufacturer's distortion rating for the complete tuner should be less than 3% harmonic content.

The high-frequency audio response of AM tuners is properly limited by

(*Continued on page* 84)

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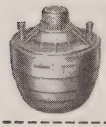

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Tuners in Hi-Fi

(*Continued from page* 83)

the band-pass of the *if* transformers. The best AM tuners provide a choice between narrow band-pass operation (with a high frequency response up to about 4,000 cycles) and wide band-pass operation (response up to 7,500 cycles or higher). The first is used when high selectivity is required to chop off adjacent channel interference or static, and the second is used for listening to extended range broadcasts. The popular belief that all AM broadcasts are held to a maximum high-frequency limit of 5,000 cycles is not true. Many transmissions *spill over* above this point, and the FCC has granted special permission to certain stations, such as WQXR, to use wider band transmission, either as a general practice or for certain musical programs. On many occasions AM programs received on wide-band *trf* tuners have been found to be of a high quality comparable to that available from FM systems.

FM tuners should provide an *af* response of 50 to 15,000 cycles within a variation of ±2 db. If this rating is given in terms of *if* band-pass, the proper width is about 175 *kc*.

Frequency drift is a problem peculiar to FM tuners. Modern tuners can be made drift-free after the first few minutes of operation by heat-compensating components in the oscillator circuit or by reactance-tube automatic frequency control circuits, which *pull* the oscillator back into frequency when it attempts to stray. If drift begins to appear in an FM tuner which was originally stable, changing the oscillator tube may correct the trouble.

The *afc* circuits have an additional advantage; tuning operation becomes much simpler. Incorrect tuning of an FM receiver unfortunately results in very annoying distortion and is a common cause of improper performance. A second useful device for aiding easy tuning is the cathode-ray tuning eye, especially the 6AL7 dual indicator type.

Tuner Sensitivity

Tuner sensitivity is an important consideration if the receiver is to be used in a fringe area, or if surrounding buildings act as shields against the wave transmissions of certain stations. FM sensitivity is most reliably rated in the number of input microvolts required to provide complete *quieting* by FM limiter action. Another type of sensitivity rating refers to the minimum number of microvolts of signal which are needed for acceptable recep-

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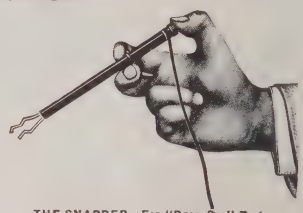

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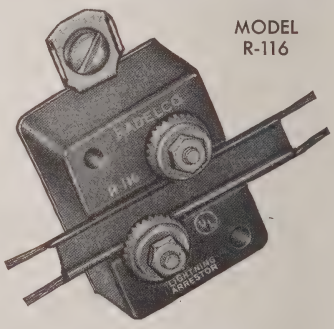

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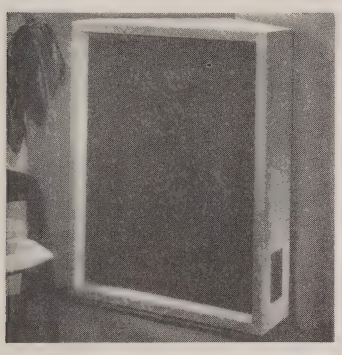
tion. The latter is usually at least twice as great as the quieting sensitivity.

A chart indicating sensitivity standards for FM tuners appears in Fig. 6 (p. 34).

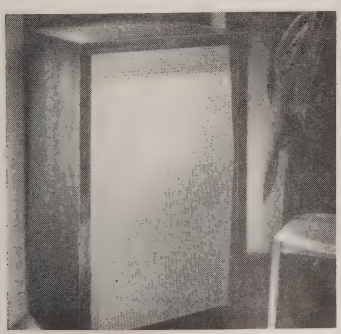
Audio

(*Continued from page 63*)

idler wheel slide should be moved away from the turntable rim to release the idler wheel; this operation should be performed from underneath the changer. The turntable will slide down the centerpost and away from the changer pan. When removing the turntable from the centerpost, it is important to be careful that the thrust washer doesn't fall off and become lost. When replacing the turntable, the motor idler wheel slide should be moved *from underneath the changer* so the idler wheel will be toward the centerpost. This will permit engaging the idler wheel with the rim of the turntable. The rubber tire on the idler wheel should not be touched with fingers nor should any attempt be made to pry the wheel with any tools. The idler wheel should always be moved by moving the slide.



Folded horn speaker enclosures. At top is a front-loaded corner enclosure (*31 series*) augmented by two independent Helmholtz resonators. A folded horn corner-console enclosure with an exponential rear-loaded horn (34 series) is at bottom. Cone speaker in system is said to act as a direct radiator above 150 cps. (*Types D-34001-M, D34130-M and D-31050B; James B. Lansing Sound, Inc., Los Angeles.*)



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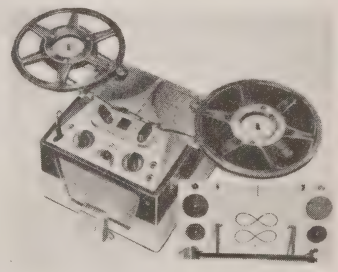
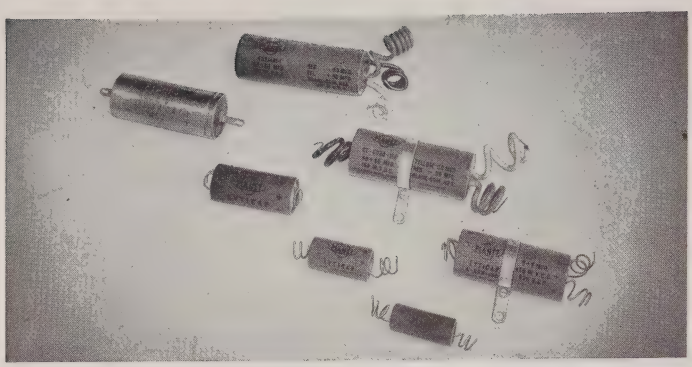
(Right)

A 10½" reel adapter which is claimed to increase recording or playback time to 4 hours. Adapter will operate either the standard large NAB hub or the smaller commercial type hubs. Feature is said to make it unnecessary to remove the adapter for operation with either the 5" or 7" reels. A universal joint under each reel sprocket permits horizontal and vertical positioning for proper tape alignment and reel adjustment. (*Model X-302; Pentron Corp., 221 E. Cullerton St., Chicago 16, Ill.*)





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Don't waste valuable space with useless oversized shelving. The new 8" deep Equipto shelving specifically designed for electronics trade can be used as a regular instantly adjustable shelf or inverted to use the turned up shelf edge for extra protection to keep valuable items from falling to floor. The 8" depth is made expressly for the narrow lineup of merchandise necessary in this field. Holds 150 lbs. without reinforcements. Can be reinforced to hold up to 1200 lbs. on each shelf.

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Use end to end as shown or back to back for maximum storage in small space. Shelves may be adjusted on any one unit on 1½" centers without adjusting shelves on any other unit.

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No. 893-8
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View of typical 8" deep shelf showing flange down.

The fast, labor saving shelf clip used to make all shelves instantly adjustable on 1½" center.

View of typical 8" deep shelf inverted showing flange up.

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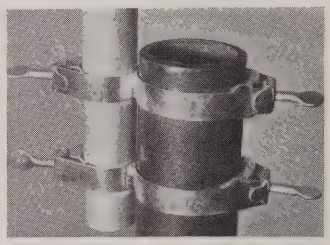
TV Antennas

(*Continued from page 36*)



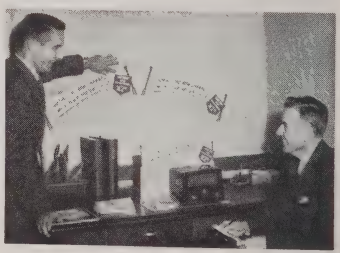
Vent pipe clamp, of plated steel and welded construction. (*Ryel Electronics Mfg. Co., 11138 Hawthorne Boulevard, Inglewood, Calif.*)

smallest diameter permissible, without jeopardizing bandwidth. Some installation shops have been utilizing conical antennas with ¼" solid rod on the basis that this material is sturdier and will therefore have a longer life in areas where severe wind, sleet, and ice conditions are encounterd. Mechanically, there is justification for this practice. It has been found during field tests* that this procedure can reduce bandwidth to such an extent that on some sets it will become increasingly difficult to synchronize sight and sound, as a result of this decrease in bandwidth.

½-Inch Elements

An antenna utilizing ½" elements can provide appreciably broader response. For example, application studies* have revealed that a ½" yagi cut to channel 4 would have better re-

W. H. Dunning, Mallory ad manager, and Earl Templeton, Mallory distributor division manager, reviewing recently prepared *uhf* converter merchandising aids. Merchandising package includes a consumer product display, banners and envelope stuffers. Display is 2-color, designed to hold one converter and a supply of consumer folders. Envelope stuffers allow space for imprints. One is designed for use by Mallory distributors to reach Service Men. Newspaper mats are also being made available, in addition to suggested news releases for local newspapers. (*P. R. Mallory and Co., Inc., 3029 E. Washington St., Indianapolis 6, Ind.*)



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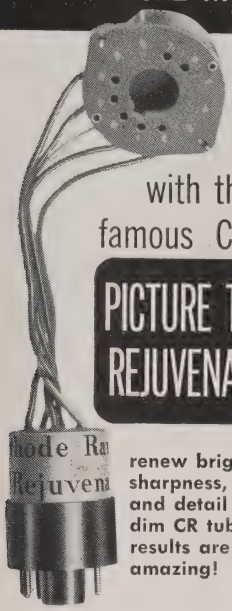

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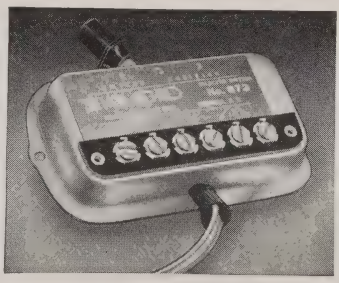
sponse than a 3/8" yagi cut to the same channel, were it desired to use this antenna to also receive channel 5.

From the viewpoint of mechanical strength, the antenna having 1/2" elements is felt to answer this requirements, not only because the elements are heavier and wider in diameter, but also because all components such as brackets and hardware, must of necessity be larger and stronger to support the larger diameter elements.

Triple-circuit antenna selector designed for selection at the receiver of signals from any one of three antennas. Maximum transfer of energy with minimum loss is said to be attained through positive contact points and an impedance closely matching the transmission line. A length of 300-ohm line is attached to the common side of the selector, while screw-terminals are provided for connections to the three selector points. A label on the unit indicates corresponding selector points and terminals. The switch is housed in a metal case with mounting facilities for installation on the rear of TV cabinets or tables. Unit can also be used as a receiver selector in a television showroom by switching the signals from the antenna to any one of three receivers. Another use of the selector is in audio systems where the signals from the amplifier may be switched from one speaker to another at will. *(No. 873; Technical Appliance Corp., Sherburne, N. Y.)*



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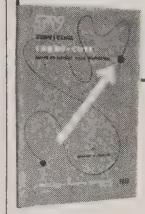

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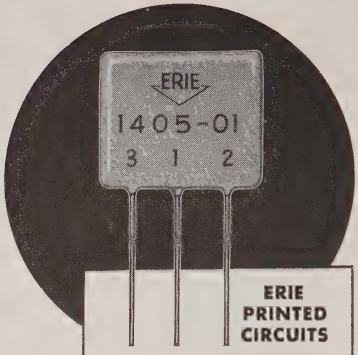

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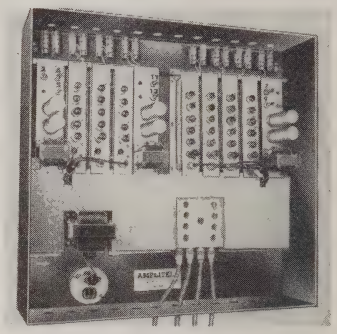
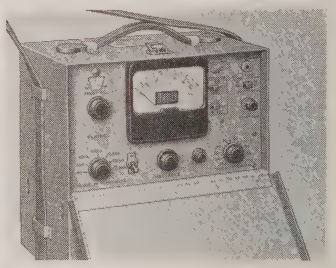
TV Antennas

(*Continued from page 87*)



Master TV antenna amplifier which is said to be designed to operate at from 250 to 5,000 microvolts. It is stagger tuned, with strips provided for low and high bands. Channel strips use four 6AG5s and a 6AQ5 or 6AN5 in the output stage. Output and voltage at final tube plate is claimed to be in excess of 1 volt. The high-channel strip uses five 6AK5s and one 6AN5. The mixing unit consists of a group of band-pass filters. The outputs from this mixing unit are fed to a common buss, which is the source of power for the distribution system. By the use of transformers any number of risers necessary for any type of installation can be used. (*Amplitel, Inc., 362 W. 57th Street, New York 19, N. Y.*)



(*Above*)

Direct reading field-strength meter, providing continuous tuning from 50 to 220 mc. Measures actual microvolts and db; 5 microvolts to 3 volts. Accuracy said to be better than 1 db. 'Scope jack available. (*Model 704; Jerrold Electronics Corp., 26 and Dickinson St., Philadelphia, Pa.*)

(*Below*)

Mast snapon standoff, a one-piece tempered spring steel standoff unit, which it is claimed does not relax a grip upon a 1¼" mast. The one-piece construction is said to overcome corrosion and stress cracking which might occur at the joint of two-piece units. Twinex insulator of the standoff is a polyethylene molded insert. Spring steel is bright zinc plated. (*SN-250; RMS*)

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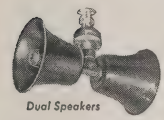

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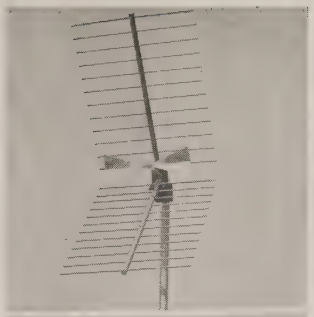
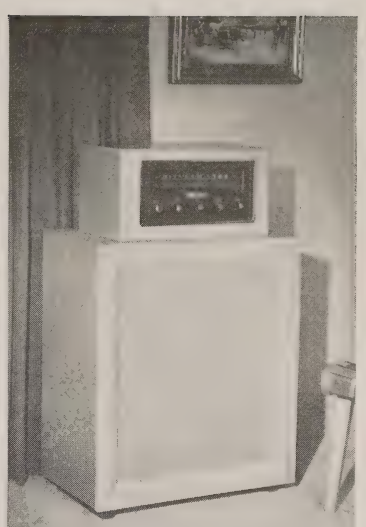


All-channel *uhf* antennas: Fan model includes a screen reflector which is claimed to provide directivity in the horizontal and vertical plane. Antenna is constructed of heat-treated alclad alloy. Insulators are molded of polystyrene compound. The reflector is designed for low wind resistance. (*Reflecto-Fan and Corner Reflector*: *Walter L. Schott Co.*)

At the booth of JFD during the recent Electronics Show in Los Angeles: Claude Erlanger, of Erlanger Brothers and an Erlanger employee standing beneath a model of the JFD *Baline* yagi antenna and holding a sample of the Je-Tenna conical.



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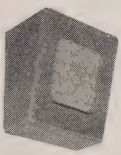

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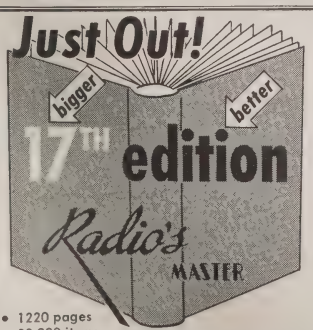

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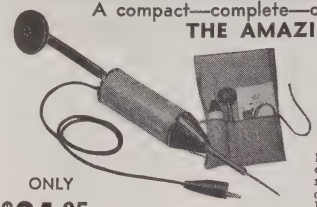

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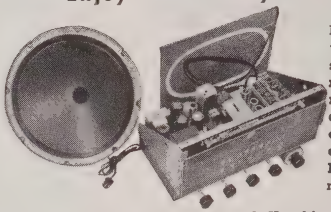

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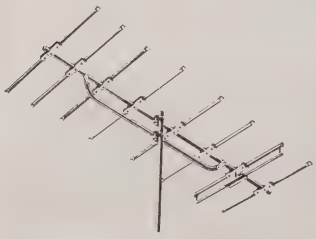
TV Antennas

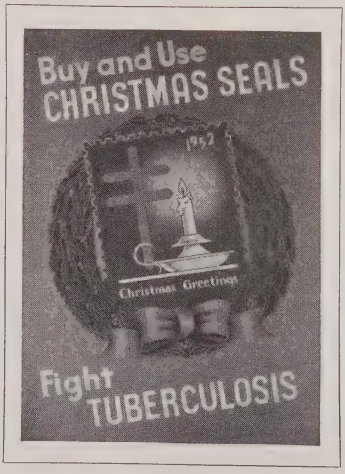
(*Continued from page* 89)

Julius Finkel, president of JFD, and 10-millionth model made since early 1946. This commemoratory antenna was a 10-element *Baline* yagi cut to channel three. JFD is said to be producing now daily between nine and ten thousand antennas.

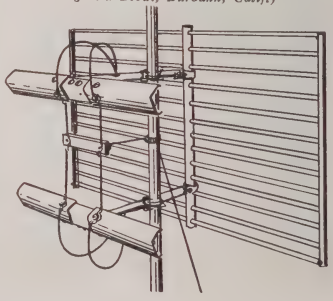
(*Right*)
At Gertz department store, during a promotion of Spico indoor TV antennas. Left to right: Milton Sprit, president, Spirling Products Co.; Marty Martin, demonstrator; Gus Hofeller, Gertz manager of major appliances, radio and TV; Jack Seitelman and John Garrett, sales personnel. (*Model 503 on view*)

Multi-element yagi. Steel brace included with low band models runs horizontally below the crossarm; steel-formed brackets grip around the major portion of the crossarm circumference. The crossarm and brace are provided with their own U-bolt attachments. Available in 8 element and 10 element models. Elements are ⅜" aluminum with pinched ends. Antenna utilizes a step-up type receiving element constructed of 1" and ⅜" aluminum tubing. The 1" aluminum crossarm is dowel-reinforced at the U-bolt to permit high tightening torques. Braces for 8- and 10-element yagis available separately. (*Model Styl8 and Styl10; RMS, 2016 Bronxdale Ave., New York 60, N. Y.*)





(*Below*)
All channel antenna which employs V-type dipoles and an eight-foot non-resonant reflector screen. On the high band the array functions as four, half-wave dipoles in phase, spaced ¾ wave ahead of the reflector screen. Operation is said to be comparable to that obtained with quarter-wave spacing on the high band, as the phase relationships are correct with either ¼ or ¾ wavelength reflector spacing. On the low band, shorted stubs across the dipole elements lower the fundamental resonant frequency and provide a good impedance match on the low channels. Reflector spacing approximates a quarter wavelength on the low band and reflector action. (*Super Vision; Davis Electronics, 4313 West Magnolia Blvd., Burbank, Calif.*)



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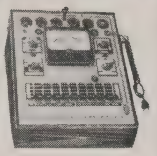
tube tester



• Tests all tubes including Noval and sub-miniatures • Completely flexible lever type switching arrangement • Tests all tubes from .75 volts to 117 filament volts by standard emission test • Tests all cold cathode, magic eye, voltage regulator and ballast tubes • Has pilot light indicator • Line voltage control cmpensates for line variations between 105 and 135 volts • Checks for shorts and leakages • Three-color hammertone panel.

MODEL 205C—
Sloping Counter Case—illustrated . $46.50
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MODEL 204
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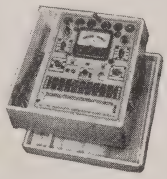
Tests all tubes including Noval and sub-miniature • Tests all batteries under rated load • Emission testing method gives easy, direct readings • Tests resistance to 4 megohms • Tests condensers from .01 to 1 mfd • Uses four-position lever type switches • Checks condenser leakage.

MODEL 204— Portable oak case, removable cover . $55.90

MODEL 206
Mutual conductance tube tester



• Checks mutual conductance on calibrated microhmo scale • Checks tubes for gas content • Detects both shorted and open elements • Tests all tubes from .75v to 117 filament volts • Tests all loctal, octal and miniature tubes • Checks individual sections of multi-purpose tubes. Built-in roll chart. Uses lever type switches.

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Ser-Cuits

(*Continued from page* 43)

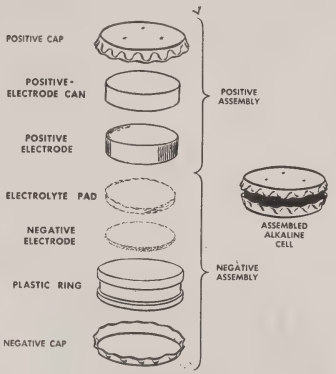
negative voltage developed across the 330-ohm resistor is more than is necessary for bias, so it is split by the voltage divider consisting of the two 3.3-megohm and the 17,020-ohm resistors. The 17,020-ohm resistor is made up of the three sections of the resistor, which is used as filament dropping in line operation, and a 15,000-ohm resistor added to make the total correct.

TV Detector Circuitry

In TV chassis, the 12AU7 often is used as a detector. In the Arvin chassis (TE331) (Fig. 4, p. 43) the second de-

(*Continued on page* 95)

Heart of alkaline B battery for *personal* portable radios: *Crown-type* cell which measures .9" in diameter and .23" in height. Two stacks of these individual, self-contained cells are incorporated in RCA's 67½-volt *B* battery (*VS216*), which is said to be nearly 25 per cent smaller than the present comparable battery (*VS016*) with an increased playing capacity of up to 100 per cent. Multiple-cell stacks are held in place in a paper tube. The metal outside shell is crimped over a hard fiber insulator which, in turn, puts pressure on the cell stacks. A small jumper strip makes the connection between the stacks. Thus, no solder connections are necessary between cells or stacks. Pressure from the metal crimp makes all necessary connections. Number of cell stacks that go into a battery depend upon its electrical requirements. After manufacture of individual cells, each cell is placed in storage for a short time to allow it to become stabilized and to expose any potentially weak cells. After storage, each cell is tested, and acceptable ones are assembled into batteries which, in turn, are tested and aged for several days. Following this aging period, completed batteries are again tested.



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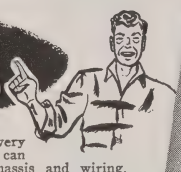

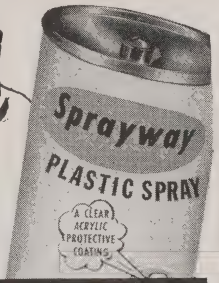

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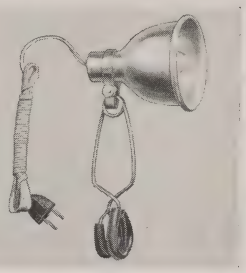

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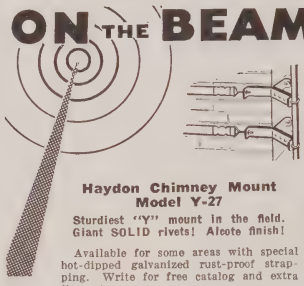

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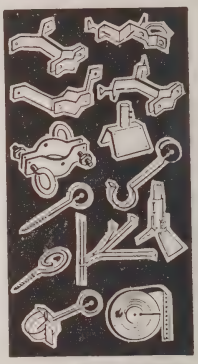

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Auto Radio Servicing

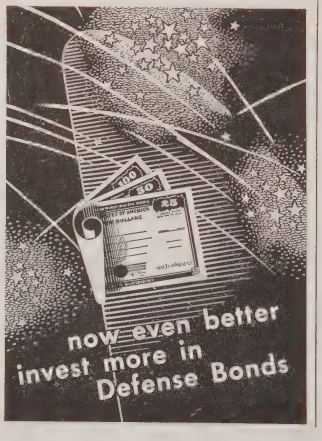
Part IV...Concluding Installment: Vibrator Arcing and Sparking Cures . . . Use of Signal Tracer

by SOLOMON HELLER*

Resistors present across a transformer primary in the vibrator circuit are for damping and serve a function somewhat similar to that of the buffer. They prevent the transformer primary current from falling sharply to zero when the vibrator reed breaks away from a contact, by providing a shunt path for the current. Arcing due to abrupt current changes is thus reduced. If excessive sparking is noted in the vibrator, a check for an open-circuit or large increase in resistance in one or both of these resistors is in order.

If the vibrator is not sealed in, and can be taken apart, the leads inside the metal case may be checked. Worn or otherwise damaged insulation present on these leads, rather than a fault in the vibrator itself, may be responsible for defective or no vibrator operation.

If the vibrator parts seem dirty, benzine may be used to clean them. Sticking contacts may be due to a shorted buffer. This defect should be checked for and eliminated if present, and the vibrator tested once more.



When the vibrator contacts look worn or pitted, replacement of the vibrator is the best-advised procedure. Filing the points smooth is a simple procedure, since the correct spacings must be observed. The job is delicate, tedious and hardly worth-while.

Using Signal Tracer to Locate Interference

When difficult cases of interference are being tracked down, a signal tracer may prove quite handy. A long *ac* line cord will be needed on the tracer to connect it to the source of power. It is assumed that the tracer has an *rf* probe.

The probe should be brought near different points of the car's electrical system. When the probe comes near a unit or wire which is insufficiently

*Coauthor of *Television Servicing*.

shielded, bypassed or bonded, noise pickup will be very noticeable. The probe should be moved around slightly until maximum noise is obtained. Units in the immediate vicinity should then be checked for poor grounds, improper shielding, etc.

The signal tracer employed should be a very well shielded one, of moderate or low gain.

When the interference problem has been solved, or apparently solved, the car should always be tried out on the road, under a variety of conditions, before the repair is assumed to be complete.

Interference problems in modern cars are few and far between, in spite of the detail with which we have considered them. When such a problem arises, however, the Service Man must know enough to lick it.

Tube News

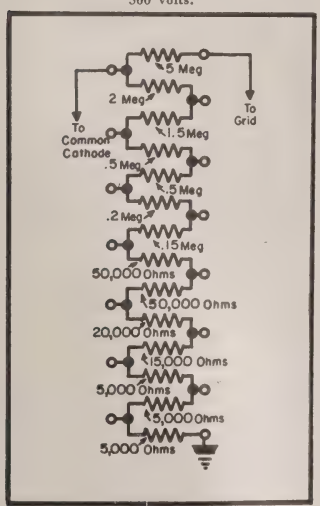
(*Continued from page* 40)

approximately 5 *ma,* a relatively high value for *vtvm* bridge tubes. The grid current which usually attends such operation of a vacuum tube is balanced out in the center-tapped divider network. High plate current operation of the 12A4 was found to afford a sensitivity of 0.5 *v* full scale on a 0-1 *ma* meter, with stability comparable to that of less sensitive designs.

In this circuit, the resistance between grid and the common cathode return is kept equal by using an ordinary ganged switch with two wafers; one used for the cathode return and

(*Continued on page* 94)

Fig. 4. A divider table for cathode center tap in *vtvm*. Ranges are .5, 1.5, .5, 15, 50, 150 and 500 volts.



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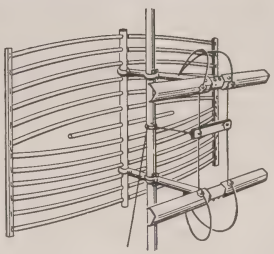

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Tube News

(*Continued from page 93*)

the other for the high grid input. The divider chain is somewhat unique in that it must be arranged to give the desired ranges, and also, keep the common cathode return midway in resistance between the two grids. It can be accomplished for any divider network by using two resistances which total up to the value of each original divider resistance. The resistor nearest the high grid should have a value half that of the total remaining in the divider below the tap tied to the high grid. An example of such a divider is shown in Fig. 5.

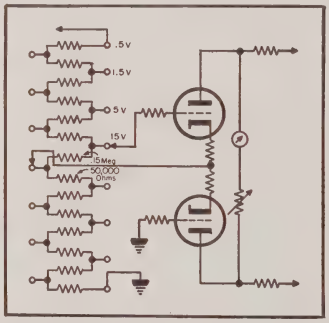
Heater Supply Requirements

The 12A4 will operate very satisfactorily with a heater supply of 5.5 *v*. Use of this reduced heater voltage has been found to extend life considerably and increase the stability of the circuit in general.

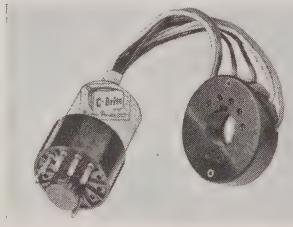
A constant input resistance of 10 megohms can be maintained through all ranges and the source resistance of the voltage makes practically no difference in the reading obtained.

No difficulty was experienced from the use of the power supply above ground; ordinary power transformers have sufficient insulation resistance for this purpose.

Fig. 5. Circuit showing how a 15-volt range would be set on the divider.



Auto-type booster transformer designed to increase picture-tube filament voltage to 7.80 *v* and increase electron emission in older picture tubes. For use in sets with parallel-wired filaments. (*C-Brite; Perma-Power Co., 4721 North Damen Ave., Chicago 25, Ill.*)



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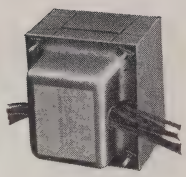

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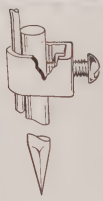
South River NEWS



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Dynamic *cathode-ray tube analyzer*, designed to test all TV picture tubes, both magnetic and electrostatic deflected types, and analyze 'scope, radar, and other special purpose *cr* tubes, without removal from chassis or carton. Four classes of tests are made with analyzer. The beam current test is made to the final anode rather than to the grid or any other element. The beam current scale of the meter is said not only to indicate sufficient or insufficient beam current, but give an accurate forecast of remaining tube life. A grid test is provided to observe grid control over the beam current. If harmful gases have accumulated in the tube, the analyzer can also detect their presence; the gas test indicates whether or not the gas is sufficient to threaten quick failure of the screen or cathode or both. All elements are isolated for individual interelement leakage tests. A high sensitivity circuit is used to show indications of leakage on the neon lamp. Instrument is designed around a highly sensitive, balanced bridge-type *vtvm*. A continuously variable line voltage adjustment is provided to assure accurate readings. A full vision meter includes a line voltage adjust point, a beam and gas current range, and a reference scale. (*Model 707; Jackson Electrical Instrument Co., 18-54 S. Patterson Blvd., Dayton 2, O.*)

Ser-Cuits

(*Continued from page* 91)

tector uses ½ of the 12AU7. The grid (pin *2*) performs the operation of a diode plate for detection of the video information. The plate (pin *1*) is used as another diode plate, detecting the *if* signal for use as an *agc* voltage.

Delay of the *agc* voltage is accomplished by raising the cathode to a +2.4 volts. The plate (pin *1*) is returned to ground through R_{144}. The cathode (pin *3*) is +2.4 volts above ground (bias developed across R_{148}.) This 2.4-volts serves as a *delay*; an *if* signal of 2.4 volts must be developed before the *agc* diode will conduct. The grid (video diode) has no bias and will conduct current on a very low signal for video detection.

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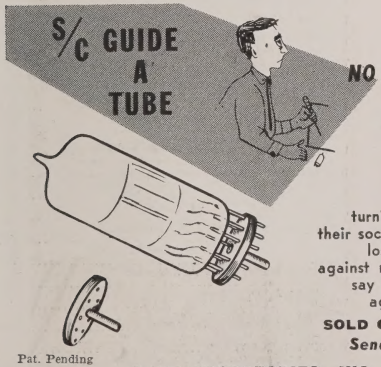

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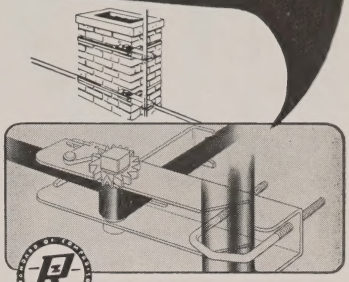

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Model AK85 The fastest-installed chimney mount ever devised for TV antennas! Rugged in design—simple to install. Simply thread strapping through rachet, around chimney and back through rachet—wind up rachet tight—and the job's done! Heavy gauge, zinc-plated steel with large "U" bolt for up to 1¾" O.D. mast and full length galvanized steel strapping.

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CLEVELAND 13, OHIO

Radio and Television Controls and Contacts

ONE DROP

- Cleans and preserves all controls and contacts
- Eliminates noise
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INVERTERS
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JOTS AND FLASHES

THE HIGH COST OF LIVING may be on the increase, but the cost of TV sets is running contrary to this inflationary trend, according to *W. C. Johnson,* vice president of Admiral. The first TV set made by the company only five years ago cost 870 per cent more than a current '53 model, using screen size for comparison. A 10" set, providing 48" of viewing surface, cost about $7.29 a square inch in '47, while today, a 21" chassis providing 220 square inches of viewing space costs only 91 cents a square inch. . . . Sixty-eight per cent of TV picture tubes sold in August were 18" and larger, RTMA has reported. . . . The Rome Air Development Center, Rome, N. Y., urgently needs electrical engineers and physicists for air research and development. All interested persons should contact *Robert R. Easter.* . . . *Dan D. Halpin,* general sales manager of the receiver division at DuMont, has been elected an honorary life member of the Radio and TV Executives Society. . . . *Tom Cox* has been appointed district manager for the New Jersey and eastern Pennsylvania territories for National Union's renewal sales division. *William W. Posey* was named district manager for the Chicago territory. . . . *Crosley Division,* Avco Manufacturing Corp., has contracted to purchase the manufacturing facilities of the tube divisions of Sarkes Tarzian, Inc. . . . An additional plant in Chicago has been opened by Clarostat Manufacturing Co., Inc. . . .

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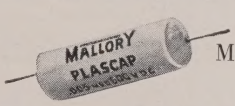
Make Sure! Make it Mallory!

Repair work that insures satisfied customers is yours every time if you always specify Mallory capacitors, because outstanding performance is built into *all* Mallory capacitors.

Mallory FP's are the only fabricated plate capacitors available to the replacement trade. And they are accepted as *the* top-notch capacitors by the makers of TV and radio sets. Mallory FP's give long-lasting service even at 185° F. (85° C.).



Mallory Plascaps* are the first completely engineered plastic tubular capacitors. Always use them and avoid leakage . . . premature shorting . . . unsoldered leads . . . off-center cartridges. Count on Mallory Plascap as you do on Mallory FP's.

In the past 25 years, Mallory research and engineering work has resulted in a series of developments that give you capacitors which are smaller . . . more uniform . . . longer-lasting . . . more resistant to heat. Look to Mallory for future capacitor improvements. Order Mallory capacitors today and be sure.

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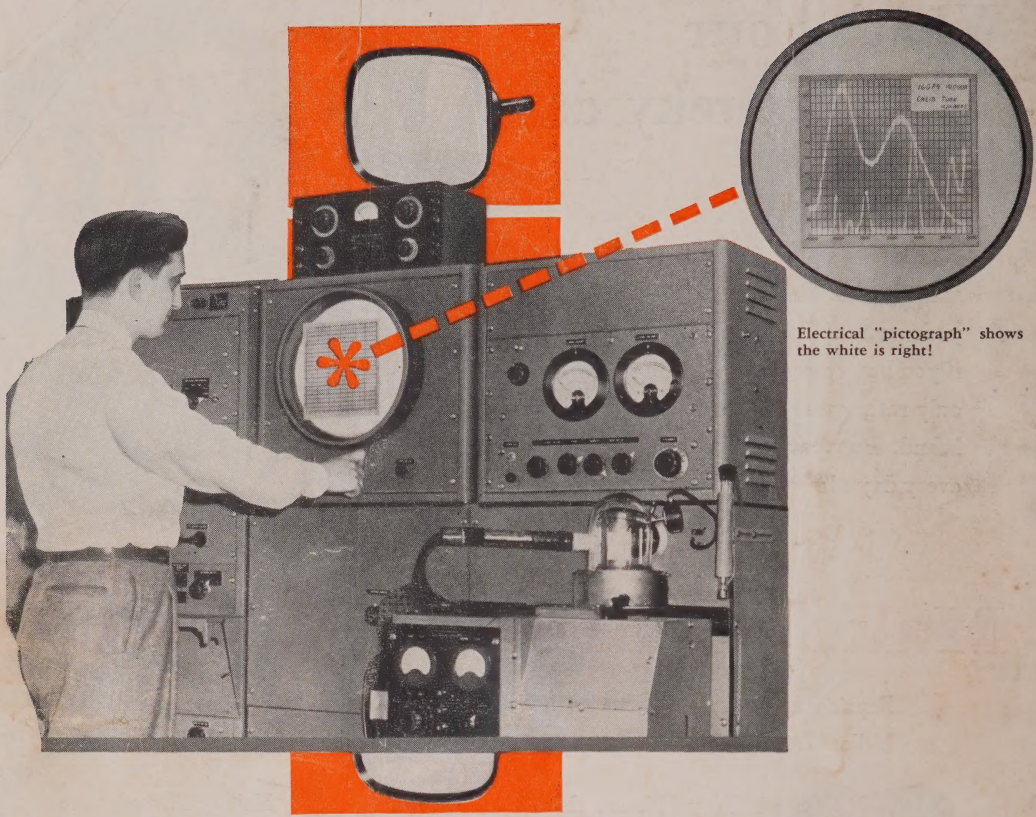

Electrical "pictograph" shows the white is right!

How we get white that's just right

for RCA picture-tube screens

MIX BLUE AND YELLOW paint and you get green. But mix "blue" and "yellow" phosphors and you get *white* . . . or what appears white to the eye. So it is that the fluorescent screen of a picture tube consists of about two billion tiny "blue" and "yellow" luminescent crystals. By the principle of *color addition,* the colored light from the individual crystals stimulates the eye to give the *impression* of white light.

The problem is you can get white that is yellowish, or white that is bluish . . . depending on the blend of the "blue" and "yellow" phosphors. Getting a white that's *just right* for picture-tube screens is no easy trick. It calls for extremely precise *color control* of the phosphor.

RCA does it with a *spectroradiometer.* This instrument permits very accurate measurement of the *shade* of the "blue" and "yellow" phosphors. Based on this information, batches of "blue" and "yellow" phosphors are selected and blended to give the desired shade of white. Each blend is tested in a pilot run of picture tubes, and these tubes are also measured on the spectroradiometer. Only when a pilot run shows the desired white is a blend approved for production use. Result: *"Off-color" picture tubes never reach your shop.*

RCA's constant vigilance at all stages of manufacture is your assurance that only top-quality RCA Kinescopes leave the factory. In this way, RCA closely guards its own reputation . . . *and yours as well.*

With RCA Receiving Tubes, as well as RCA Kinescopes, TOP-QUALITY CONTROL makes the difference.

RADIO CORPORATION of AMERICA

ELECTRON TUBES **HARRISON, N. J.**